Western Cape Government
Environmental Affairs & Development Planning

ENERGY CONSUMPTION AND CO_2e EMISSION DATABASE FOR THE WESTERN CAPE

March 2018

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ACRONYMS

CCT	City of Cape Town
CFL	Compact fluorescent lamp
CO_2	Carbon dioxide
CO_2e	Carbon dioxide equivalent
DoE	Department of Energy
EE	Energy efficiency
GDP	Gross domestic Product
GHG	Greenhouse emissions
GJ	Giga Joules
HFO	Heavy fuel oil
HVAC	Heating, ventilation, and air conditioning
IPP	Independent Power Producers
km^2	Square kilometre
kWh	Kilowatt hour
LED	Light-emitting diode
LPG	Liquefied petroleum gas
MW	Mega watt
MWh	Megawatt hour
NERSA	The National Energy Regulator
PSG4	Provincial Strategic Goal 4
PV	Photovoltaic
RDP	Reconstruction and Development Programme
REIPPP	Renewable Energy Independent Power Producer Procurement
tCO_2e	Tonnes of carbon dioxide equivalent
TJ	Terra joules
TSA	Technical Service Areas
WC	Western Cape
WCG	Western Cape Government

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INTRODUCTION

Emission of greenhouse gases continue to negatively impact the Earth's climate. Reporting of these emissions have become an important tool in managing climate change. This is the third iteration of the Energy Consumption and CO_2 Emissions Database for the Western Cape. The first database was undertaken in 2012 using 2009 data (known as the 2009 database). The 2nd iteration was completed in 2015 using 2012/13 data (known as the 2012/13 database)[1]. The 3rd iteration (current report) was completed in 2018 using 2015/16 data and was completed by the Climate Change Directorate in the Western Cape Department of Environmental Affairs and Development Planning.

The Western Cape Government (WCG) has strongly emphasised energy security and climate change responses in the Provincial Strategy Plan (2014-2019), through the Energy Security Game Changer interventions and recently having Climate Change elevated to an enterprise level risk for WCG. This links closely with the WCGs mandates around economic development, planning and the environment. It is widely acknowledged that effecting climate change responses as well as promoting energy use that supports poverty alleviation, reduced emissions and enhanced security relies substantially on input and action from local and provincial governments.

The database has been developed to support the strategic intentions of the WCG specifically in relation to the Western Cape Climate Change Response Strategy (2014) and the Provincial Strategic Goals, in particular PSG4 (enable a resilient, sustainable, quality and inclusive living environment). It has been designed to meet the following objectives:

- To provide an overarching energy consumption and CO_2 emissions database for the Western Cape. This builds on a 2007 data collection exercise[2] as well as the 2009 and 2012/13 database in order to track energy consumption and associated emissions over time. It will also deepen the WCGs understanding of key energy and emission picture, both in terms of sector consumption and geographic distribution of that consumption;

- To provide a disaggregation of provincial energy and emissions profiles down to the district level. This disaggregation is intended to enhance regional level energy and emissions management and tracking;

- To contribute to the national efforts underway to build and develop a solid foundation of energy consumption and emissions data towards improved energy planning and climate response action, and the implementation and evaluation of impacts.

This assessment has focussed on gathering the high level "demand-side"[3] energy consumption and emissions data picture and balancing this with the total supply of fuels coming into the province. While it is relatively easy to get supply-side[4] information, understanding where and how these fuels are used is more difficult; however, understanding it is of enormous importance when considering efficiency and demand side management options and exploring and modelling future demand.

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1 This report was not publicly released, but the data is available on request.

2 A previous exercise was undertaken in 2007 using 2004 data for the development of White Paper on Sustainable Energy for the Western Cape, but the methodology differed from the current exercise.

3 Demand-side refers to the energy end-users. These are large the economic sectors within the Energy picture such as the residential, transport, industrial sectors, etc.

4 Supply-side refers to the classification of both primary and secondary energy types that are distributed to the demand-side for use. These include coal, electricity, liquid fuels amongst others.

The emphasis of this database report is to provide a concise account of the energy consumption and CO_2 emissions and how this picture was derived. The database is currently updated every two years, based on the availability of data, but the frequency of the updates will be reviewed as part of the revision of the Western Cape Climate Change Response Strategy which is being undertaken in 2018/19.

METHODOLOGY

This report provides a high-level overview of the energy related emissions picture of the Western Cape for 2015/16. The 2009 database included a waste-related emissions assessment, but this has not been updated due to the difficulties in getting appropriate level of waste characterisation data for the whole province in order to complete the exercise[5]. All the emissions figures given in this report are thus for energy-related emissions only.

Data collection and collation process

The data collection for this version of the Energy Consumption and Emissions Database was for the period July 2015 to June 2016 (the municipal financial year). This was requested by municipalities during the data collection phase of the 2009 database in order to align more closely with their reporting requirements to NERSA. The fuels / energy carriers assessed in this report are electricity, coal, petrol, diesel, paraffin, LPG, HFO, jet fuel and aviation gas.

A different methodology for the collection of electricity data was used, with all information gathered from Eskom and analysed in order to finalise an energy profile for each district. As this is a high level analysis, exact numbers are not required to complete the exercise.

Table 1 - Supply side energy data sources

FUEL TYPE	DATA SOURCE
Electricity	Eskom
Liquid Fuels	Department of Energy
Coal	Atmospheric Emissions License database for the Western Cape

Eskom does not collect data on a municipal boundary basis, but rather in line with their Technical Service Areas (TSA). As part of the 2009 database, the TSA data was adjusted in order to bring it in line with the geopolitical district boundaries. The same methodology was used for the 2012/13 and 2015/16 data collection exercises.

Liquid fuel data was received from the national Department of Energy. The methodology developed, by Sustainable Energy Africa, as part of the 2009 database is still applied; the liquid fuels data was converted from magisterial district to municipal boundaries.

5 Extensive work is underway in terms of waste characterisation at a municipal level, there is however currently not sufficient information available to provide an estimate of the waste-related emissions for the Western Cape.

In terms of liquid fuels, it is difficult to get a sector breakdown without a much more detailed data collection exercise. For this purpose, the following breakdown for liquid fuels was used:

- According to a National Treasury Report (2003), over 70% of paraffin is consumed by households. Due to the age of this data and the uncertainty as to apportioning of the remaining paraffin, it was decided, as part of the 2009 database, to assign paraffin useentirely to the residential sector. Until a more detailed study on paraffin use in the Western Cape is made available, this approach has been adopted in subsequent database updates.

- There have been limited studies on LPG use in the country. In considering how to apportion liquid fuels, the 2009 study drew on LPG allocations in other studies, including the City of Cape Town's Optimum Energy Futures Scenario. The breakdown used was 25%/25%/50% to the residential/commercial/industrial sectors respectively.

- HFO was allocated to the industrial sector.

- Petrol and Diesel were allocated to the transport sector. It is acknowledged that some processes use diesel in industrial purposes, particularly when the country was experiencing load shedding, but that level of analysis was not possible for this exercise.

It is a difficult and lengthy process to obtain coal data at the local level due to this fuel being unregulated. The Department of Mineral Resources does not keep records of coal purchases and sales at coal yards or local coal distributors, only having information on the export and sale from coal mines. Coal mine sales data, furthermore, is not broken down by geographic area but by end user e.g. electricity generation, cement production, domestic etc. Local industrial coat data was made available through the Air Quality Management Directorate in the Western Cape Department of Environmental Affairs and Development Planning through the National Atmospheric Emissions License process. Industries undertaking listed activities, as regulated by the National Environmental Management: Air Quality Act, are required to register the amount and types of fuels that they will use for boilers, generators and industrial processes in order to receive an Atmospheric Emissions License. Although this database does not provide a full picture of all users (there are thresholds in place for licenses), it is currently the most consistent source of data on coal that is available for this purpose.

Table 2 - Demand side energy data sources

SECTOR	DATA SOURCE
Residential	Eskom electricity distribution DoE liquid fuels data: paraffin
Commercial	Eskom electricity distribution
Industry	Eskom electricity distribution WCG: Atmospheric Emissions License database DoE liquid fuels data: HFO, LPG
Agriculture	Eskom electricity distribution
Transport	DoE liquid fuels data: petrol, diesel, jet fuel, aviation gas Eskom electricity distribution (rail services)

Power Lines. Wikimedia Commons - Free media repository.

WESTERN CAPE PROVINCE OVERVIEW

The Western Cape is located on the southern tip of the African continent between the Indian and Atlantic Oceans. The Western Cape Province comprises one Metropolitan Municipality - the City of Cape Town (CCT) - and five district municipalities namely Cape Winelands, Central Karoo, Eden, Overberg and West Coast.

The population of the Western Cape is estimated at 6 293 000[6]. The Western Cape's total GDP for 2016 was R424.38 billion dropping from R 438.7 billion in 2013 with the fastest growing sectors being general government services, finance, real estate and business services and construction. The province accounts for 14% of South Africa's total GDP with Cape Town accounting for 9.9% of the country's total GDP in 2016[7].

Figure 1 - City of Cape Town Metro and Districts in the Western Cape

Cape Town's economy is increasingly based on the services sector, which is relatively less energy intensive than districts with more industrial activities, but it also includes some manufacturing and construction activities. The West Coast is home to heavy industrial activities (including iron and steel and some mining). This districts contributes less than 10% to the provincial GDP, but accounts for 20% of total provincial energy consumption. The Cape Winelands District contributes to the GDP in terms of light industry and agri-processing and beyond this the province is increasingly rural in character. Along the south-east coast and the N2 highway, there are a number of larger towns. George is the 2nd largest town after Cape Town and Mossel Bay has a heavy industrial base. The towns of Knysna and Plettenburg Bay in the Eden District are key tourist hubs.

This report provides a brief energy picture for the Western Cape Province and highlights key areas or issues for attention.

6 StatsSA Survery

7 (City of Cape Town (2016). "Economic Performance Indicators for Cape Town" (PDF). Cape Town: City of Cape Town. Retrieved 20 November 2016.)

Table 3 - Key Sustainable Energy indicators – Western Cape Province

KEY SUSTAINABLE ENERGY INDICATORS	UNIT OF MEASURE	PROVINCIAL VALUE (2009)[8]	PROVINCIAL VALUE (2012/13)	PROVINCIAL VALUE (2015/16)
Total energy consumption	GJ	292 420 231	276 594 683	299 401 470
Total energy related GHG emissions	tCO_2e	37 637 336	36 345 801	38 901 581
Energy consumption per capita	GJ/capita	64	46	48
GHG emissions per capita	tCO_2e/capita	8	6	6
Energy per GDP (R' mill)	GJ/GDP	1 428	629	792
GHG emissions per GDP (R' mill)	tCO_2e/GDP	178	82	103

The Energy Picture

The picture is dominated by the City of Cape Town, accounts for nearly 60% of all energy used in the province. The more energy-intense, heavy industry of the West Coast (notably iron and steel and cement/sand industries) brings the relatively less populated area of the Province in as the 2nd highest energy consumer at 20%. Eden and the Cape Winelands Districts with some of the large towns in the province, including George, Mossel Bay, Paarl and Stellenbosch are the next highest consumers of energy at 12% and 7% respectively. Overberg and Central Karoo districts due to the nature of the activities only contribute 2% and 1% respectively to the total energy consumption in the province.

The proportional contribution of the districts hasn't changed significantly between 2009 and 2015/16, with the continued dominant contribution of the City of Cape Town and the West Coast District. The specific energy profile for each district or municipality will be discussed in more detail in the relevant chapters.

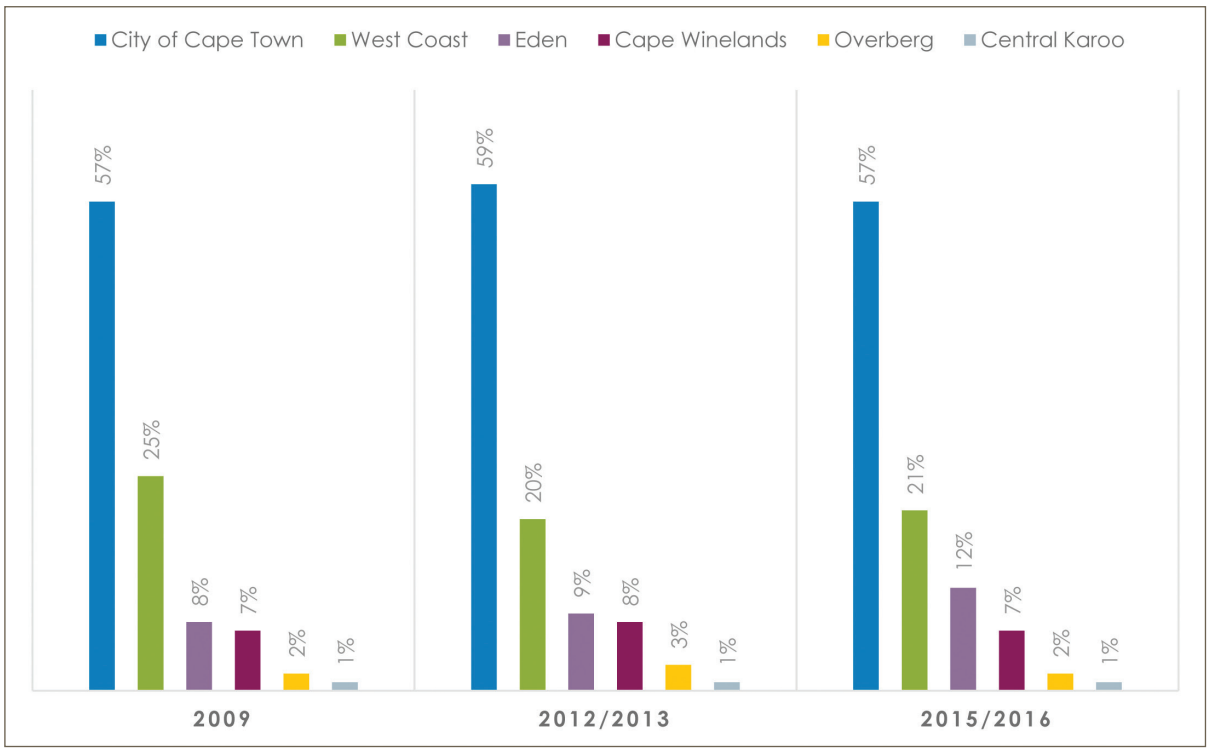

Figure 2 - Energy consumption by district / metropolitan municipality as a percentage of total provincial consumption in GJ – comparing 2009, 2012/13 and 2015/16

8 Western Cape Energy Consumption and CO_2 emissions database (Department of Environmental Affairs and Development Planning, 2012)

The proportional contribution in terms of CO_2 emissions is discussed below, which highlights the emissions per district municipality as they relate to each other. The overall CO_2 emissions in the Western Cape have taken a fluctuating trajectory, with emissions between 2009 and 2012/13 decreasing and then increasing again between 2012/13 and 2015/16. The City of Cape Town remains the largest emitter of CO_2 in the province. Although the CCT's proportional contribution to provincial emissions has decreased, the actual figures show that there has been a consistent increase in total emissions over the last three reporting periods. Although the West Coasts contribution to the provincial emissions profile has increased, the actual figures show that the emissions for 2012/13 and 2015/16 are lower than those for 2009, but there has been an increase between 2012/13 and 2015/16 as energy consumption, particularly in terms of coal use has increased. In Eden, Cape Winelands, Overberg and the Central Karoo there has been no significant shift in the emissions profile between the three assessments.

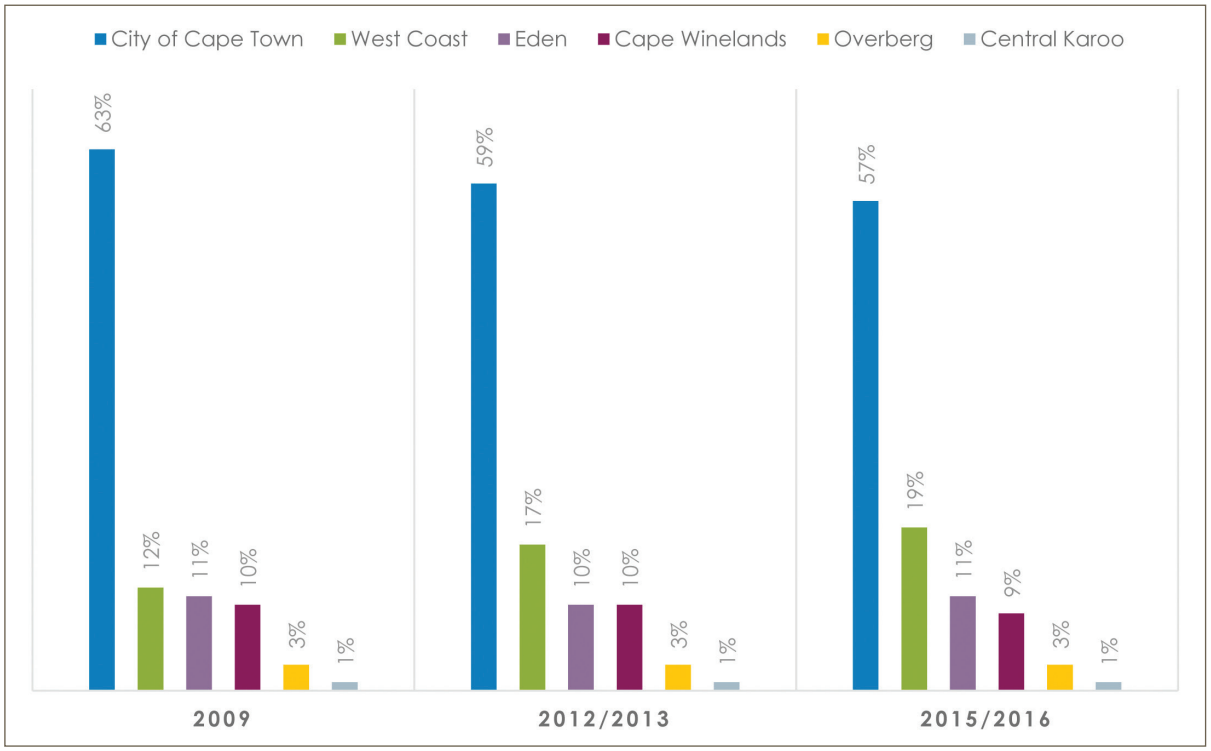

Figure 3 - Emission by district / metropolitan municipality as a percentage of total provincial consumption in GJ – comparing 2009, 2012/13 and 2015/16

Electricity, diesel, petrol and coal dominate the mix of fuels consumed in the province. The coal figures need to be read with some caution as the methodology for collecting coal data has shifted over the three iterations of the database based on the capacity to collect data and the availability of data for this reporting purpose. There has also been a significant increase in the consumption of diesel between 2009 and 2015/16. There has been little change in the consumption of other fuels.

The fuel picture demonstrates a reliance on fossil fuels in the province. Electricity is taken to be derived proportionally from the national mix, which is approximately 95% coal-fired generation and 5% nuclear. Other than electricity generated by nuclear power (Koeberg Nuclear Power Station in Cape Town) and peaking stations in the Western Cape, the balance of the electricity is brought in from north of South Africa. Direct use of coal in industrial processing contributes sizeably to the provincial energy picture, particularly in the West Coast District.

To reduce the country's dependence on the coal fired electricity, the national government has introduced a program, now known as The Renewable Energy Independent Power Producer Procurement Program (REIPPP) which aims to encourage private investment to help further develop the renewable energy sector within South Africa. South Africa, with relatively large levels of sunshine and wind throughout the year, coupled with the availability of large open tracts of land, provides the country with a huge potential to take advantage of renewable energy. The national renewable energy target is 18 800MW to be supplied by renewable energy by 2030.

In the Western Cape, a total of 14 projects has been procured during 6 Bidding rounds, 3 of them being the IPP Small Projects through REIPPP. The combined Western Cape projects will generate the total electricity of 605.6 MW annually. WC projects include: onshore wind, solar photovoltaic and biomass.

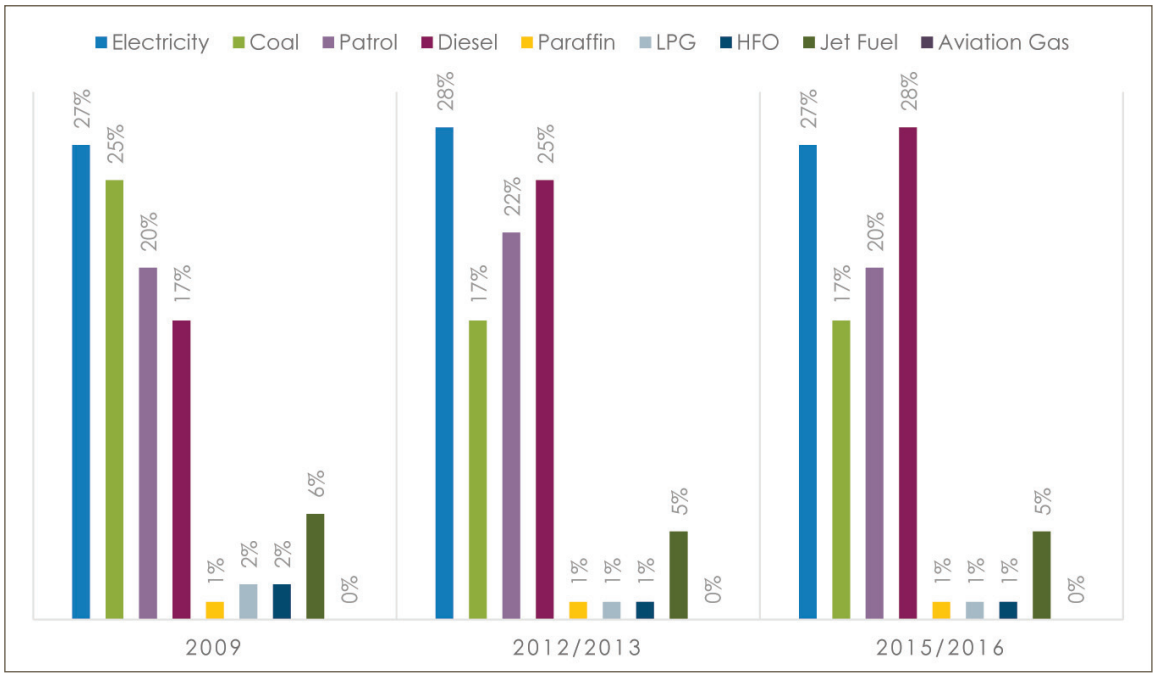

Figure 4 - Energy Use by Fuel Type in the Western Cape – comparing 2009, 2012/13 and 2015/16

The majority of energy-related emissions in the Western Cape come from electricity. Electricity, with its high carbon potential due to the role that coal plays in its generation, will continue to dominate the emissions profile until significant changes are made to the energy mix. This is followed by diesel, coal and petrol. The other fuels do not make a significant impact on the emissions profile.

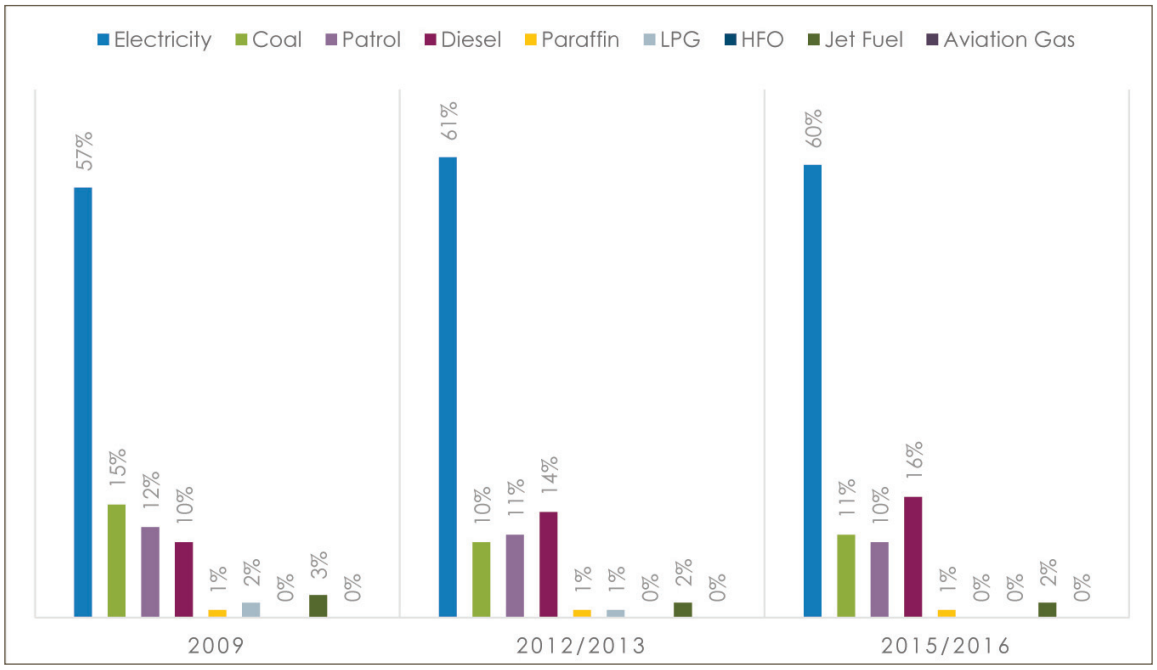

Figure 5 - Emissions by Fuel type for the Western Cape (CO2e) – comparing 2009, 2012/13 and 2015/16

Tracking energy and emissions over time

Energy related data for the province was first collected in 2007 (using 2004 data) and then in its current format from 2009 to 2015/16. There have been some data collection changes in the methodology for these databases, which means that strong conclusions cannot yet be drawn as part of the analysis. The emerging picture shows that total energy consumption has grown steadily since 2004, except for a decrease in 2012/13.

Table 4 - Tracking energy consumption by sector between 2004 and 2015/16 in the Western Cape Province

SECTOR	2004[9]	2009	2012/13	2015/16
	TJ	TJ	TJ	TJ
Residential	19 529	27 479	24 652	28 970
Commercial	8 872	14 434	10 921	14 430
Industrial	120 365	113 293	85 383	87 531
Transport	86 382	128 063	146 296	161 817
Agriculture	12 604	4 698	6 698	5 092
Local Government[10]		1 244	2 111	1 561
TOTAL	**247 752**	**292 342**	**276 333**	**299 401**

9 The 2004 data was collected in 2007 as part of the development of the Sustainable Energy Strategy for the Western Cape. Energy data collection practices during this time were not as developed as they are now and there are some challenges and uncertainties with this data.

10 For the 2004 data, local government was included in the commercial sector

Table 5 - Tracking energy consumption by sector between 2009 and 2015/16 in the Western Cape Province[11]

FUEL	2009	2012/13	2015/16
	TJ	TJ	TJ
Electricity	81 022	77 054	81 019
Coal	74 587	46 531	51 579
Petrol	58 588	61 326	59 746
Diesel	49 016	69 228	84 984
Paraffin	2 642	3 080	2 985
LPG	2 864	3 690	2 399
HFO	4 588	1 390	1 225
Jet Fuel	18 941	14 027	15 398
Aviation Gas	94	77	66
TOTAL	**292 342**	**276 333**	**299 401**

There was a reduction in electricity consumption between 2009 and 2012/13, but this increased again in 2015/16. There has been a decrease in coal consumption figures, but this can be attributed to a change to the methodology for calculating the coal consumption figures. There were increases across most sectors between 2012/13 and 2015/16, with the exception of the Agriculture sectors. Local governments have been implementing efficiency measures in their own operations, which are discussed in more detail in the district chapters. There have been some challenges experienced in the Agricultural sector, including the impact of extreme events and the economic downturn in the industry, which could have influenced consumption figures in the sector.

At this stage there are still many challenges and uncertainties with regard energy data collection and it is therefore risky to draw finite conclusions in comparing the figures from the different data collection periods. One would need more data in order to determine if the drop in 2012/13 is a trend or an anomaly due to the circumstances in the energy during this period. However, the current format is useful in that it gives an indication of consumption in terms of fuel types, sectors and geographical area as well as where interventions should be made in order to direct energy interventions going forward.

Sector Disaggregation

The largest proportion of energy consumed in the province is by the transport sector. In 2009 transport sector consumed 52% of energy which increased to 5% in 2012/13 and to 54% in 2015/16. The industry sector is the 2nd largest energy consumer in the province. However, the consumption in this sector has been decreasing from 34% in 2009 to 31% in 2012/13 and 29% in 2015/16. There has not been a significant change in the consumption from residential sector over the last three reporting periods. The other sectors, with smaller contributions (commercial, agriculture and local government) have also remained relatively consistent over the reporting period.

11 The fuel breakdown for the 2004 data is not available.

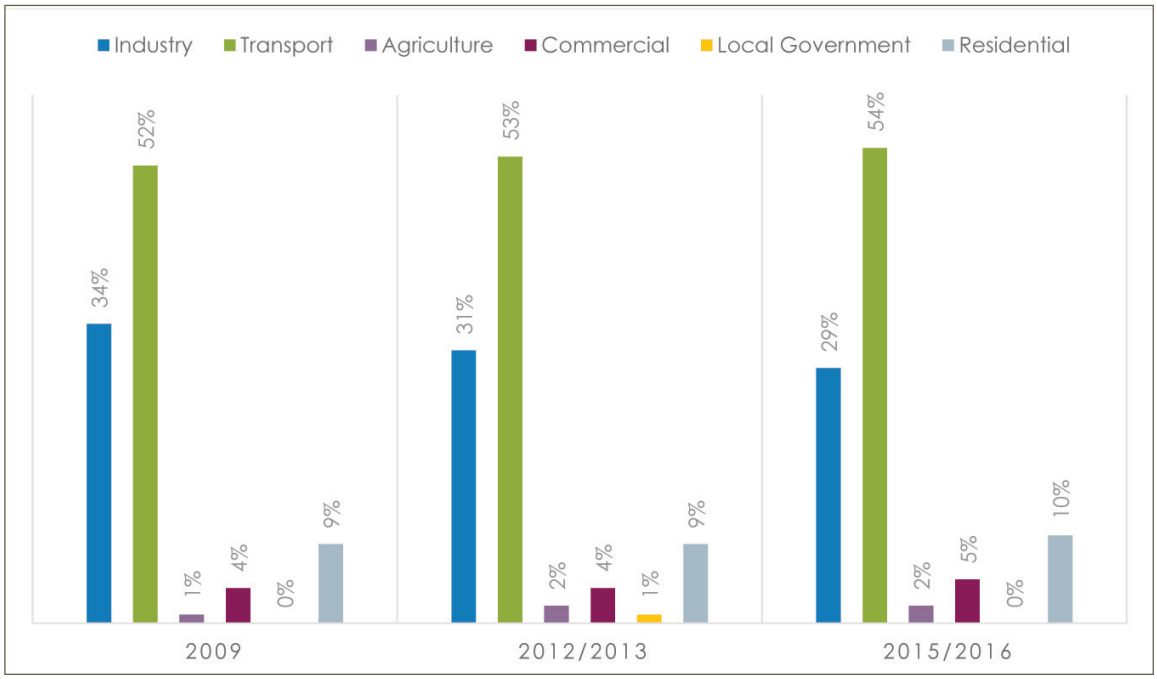

Figure 6 - Energy consumption by Sector for the Western Cape (GJ) – comparing 2009, 2012/13 and 2015/16

It is industry, however, and not the transport sector that contributes the most to the provincial emissions profile at 36% in 2015/16 which is a decreased from 38% in 2009 and 2012/13, as it draws from coal-derived electricity as well as a fairly large amount of direct coal consumption.

The transport sector follows at 31% in 2009, 29% in 2012/13 and 36% in 2015/16. The 3rd largest CO_2 emitter is the residential sector at 19% in 2015/16.

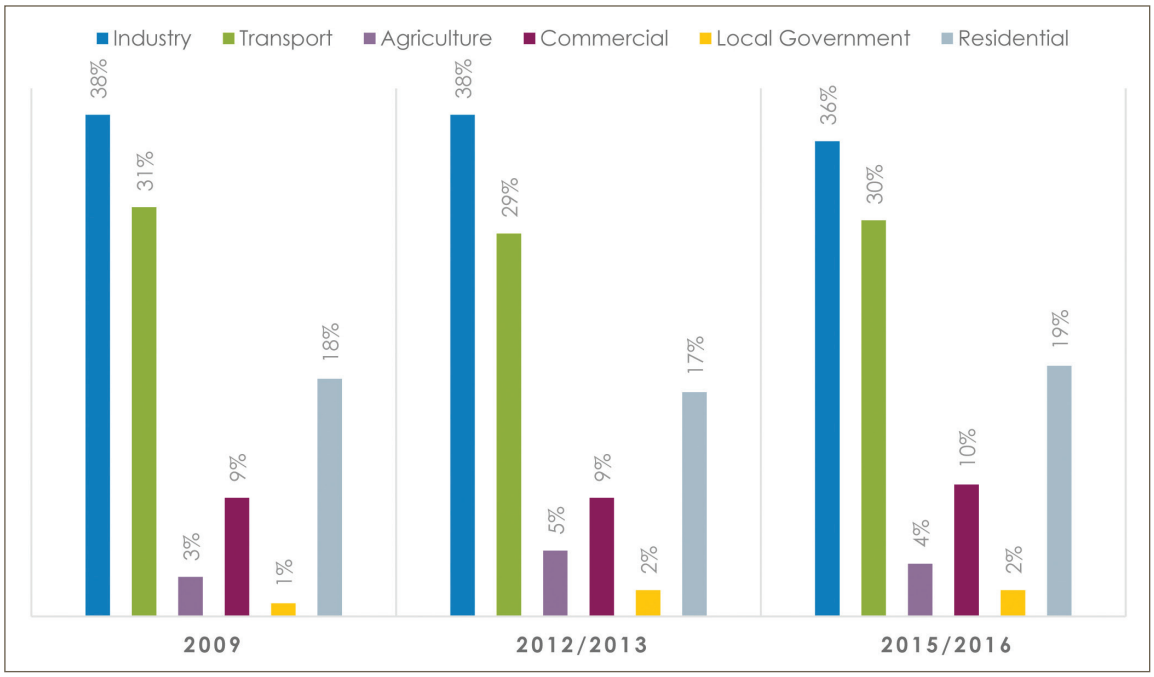

Figure 7 - Emissions by sector for the Western Cape (CO_2e) – comparing 2009, 2012/13 and 2015/16

It is worth exploring electricity consumption by sector, given that this is the single largest energy source in the Western Cape. Although industry was the predominant consumer of electricity until 2012/13, the residential sector is now the major consumer of electricity. The impact of load shedding experienced during this period could explain some of the changes.

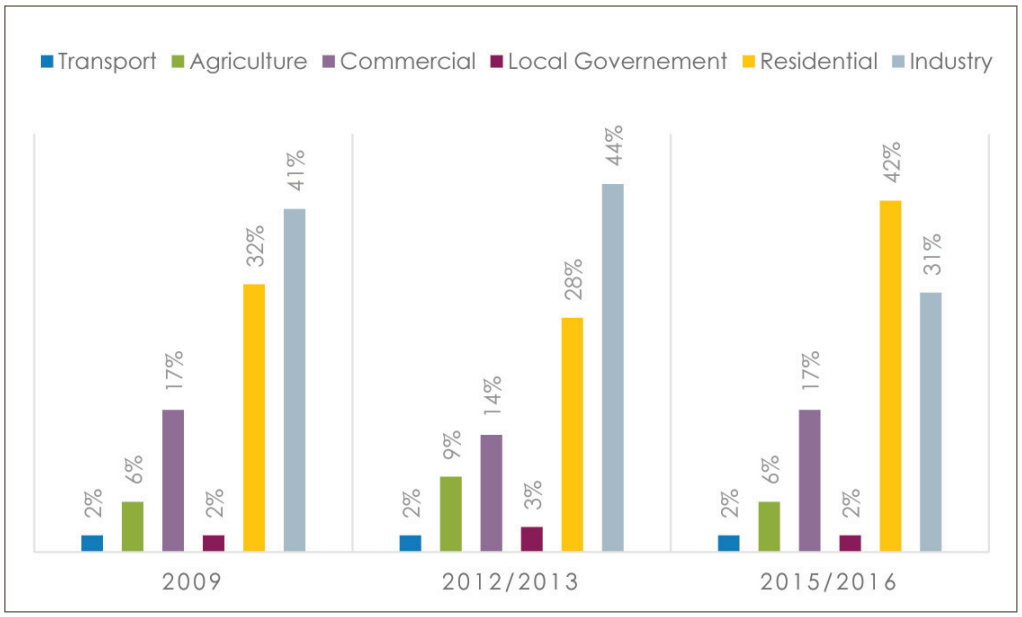

Figure 8 - Electricity consumption by Sector for the Western Cape (kWh) - comparing 2009, 2012/13 and 2015/16

Athlone Power Station and Water Coolers. Wikimedia Commons - Free media repository.

CITY OF CAPE TOWN

Overview of the Municipal Area

The City of Cape Town (CCT) is the only metropolitan municipality in the Western Cape province and is the 2nd largest city in South Africa[12]. The CCT has the largest population of all municipalities in the Western Cape, with an estimated population of 4 004 793 in 2016[13].

The fluctuating national economy has also impacted the economy of the Western Cape. The main economic activities are dominated by the tertiary sector, which includes commercial services and industries and the secondary sectors, including manufacturing and construction[14]. The CCT remains the economic hub of the province contributing 72% to the GDP in 2016[15]. Like other provinces in South Africa, Western Cape municipalities including the CCT has been negatively impacted by the drought.

The informal economy[16] in the CCT does not contribute significantly to the formal economy, but it plays a role in the employment sector and thus contributes greatly to poverty alleviation.

The electricity supply in Cape Town is divided between Eskom and the City of Cape Town. The CCT provides access to approximately 75% of the electricity customers in the municipality with Eskom serving the remaining 25%.

This report provides a high-level snapshot of the current energy profile of the City of Cape Town.

The Energy Picture

Table 6 below highlights the City of Cape Town profile over the last three iterations of the Western Cape Energy consumption and emissions database which reflects an increase in total energy consumption since 2009; this is not evident in the per capita and GDP figures which have been gradually declining over the years. This can indicate some decoupling of economic growth from energy consumption[17].

Table 6 - Key Sustainable Energy Indicators in the City of Cape Town

KEY SUSTAINABLE ENERGY INDICATOR	UNIT OF MEASURE	2009	2012/13	2015/16
Total Energy consumption	GJ	151 179 379	163 809 550	169 880 891
Total CO_2e emissions	tCO_2e	19 869 351	21 373 421	21 927 790
Energy consumption per capita	GJ/capita	56	45	42

CONTINUE

12 In terms of population, Johannesburg has the largest population at 4.4 million

13 Cape Town annual report 2015/16

14 Reference: State of Cape Town report, 2016 and MERO, 2017

15 Reference: MERO 2017

16 The informal economy is a diversified set of economic activities, enterprises, jobs and workers that are not regulated or protected by the state. The concept originally applied to self-employment in unregistered enterprises. It has been expanded to include wage employment in unprotected jobs (source: WIEGO – Women in informal Employment: Globalising and Organising)

17 Decoupling refers to increasing the energy productivity of economic activities and also refers to some level of decarbonisation of economic activities. There are a number of reasons for this, including reduced consumption of energy through efficiency interventions as well as the increased use of renewables and cleaner energy sources.

KEY SUSTAINABLE ENERGY INDICATOR	UNIT OF MEASURE	2009	2012/13	2015/16
GHG emissions per capita	tCO_2e/capita	7.0	5.7	5.4
Energy per GDPR (R' mill)	GJ/GDPR	1 074	674	615
GHG emissions per GDPR (R' mill)	tCO_2e/GDPR	134	85	79

During 2015/16, diesel was the biggest contributor to energy consumption in the CCT at 35%. Diesel was followed by electricity 27% proportional consumption[18] and petrol at 26%. The proportional contribution of electricity has decreased slightly, but the actual consumption figures show a small increase. Diesel use for 2015/16 has increased by 5% compared to 2012/13 and experience a significant increase of 20% when compared to 2009 figures.

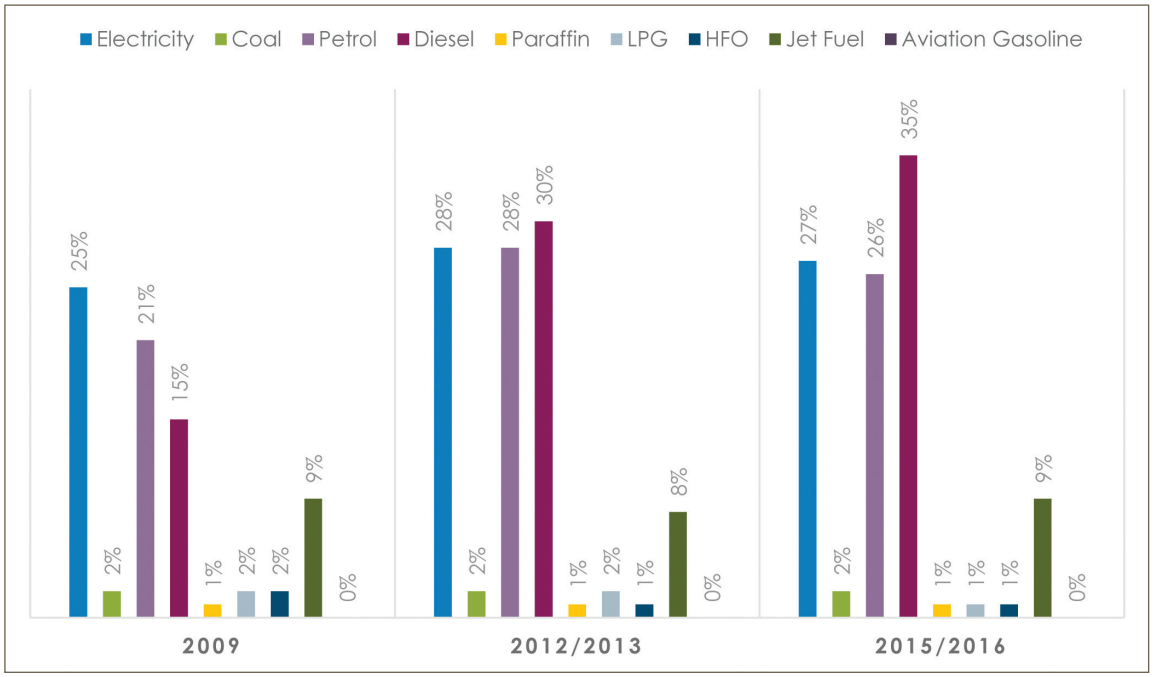

Figure 9 - Energy Use by Fuel type for the City of Cape Town (GJ) – comparing 2009, 2012/13 and 2015/16

The increase in diesel consumption could be associated with load shedding experienced during 2015. This led to more people and companies shifting to diesel generators or running industrial processes off alternatives to electricity. The steep increases in petrol prices over the past years may have contributed to a shift from petrol vehicles to diesel-powered vehicles, which can have greater fuel economy and are, in some cases, more efficient.

The lack of a significant change in the electricity consumption in the CCT, can be seen to be due to rising electricity prices, increased implementation of energy efficiency projects and initiatives throughout the CCT as well as the increased uptake of renewables[19] along with a growing population.

Electricity emissions remain the dominant of source of CO_2e emissions in terms of the City's energy mix, contributing 61% of the total energy related emissions during 2015/16. Electricity derives its carbon emissions from the burning of coal as the predominant sources of electricity on the national grid.

18 Proportional contribution refers to the percentage consumption that this fuel is consuming compared to the total consumption. In some cases, there may be an increase in percentage contribution of the fuel, but when looking at the actual figures this will show a decrease over time. The details around this will be discussed in the relevant chapters

19 Reference City of Cape Town State of Energy, 2016)

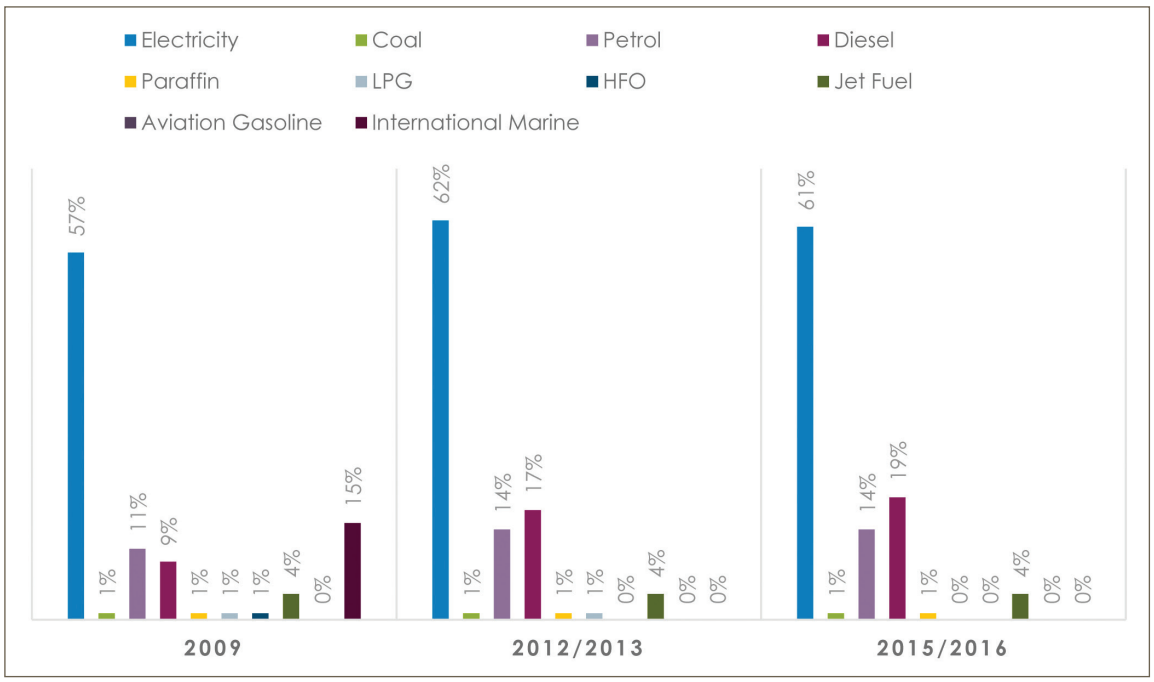

Figure 10 - emissions by fuel type for the City of Cape Town – comparing 2009, 2012/13 and 2015/16

Emissions from petrol remained consistent at 14% for 2012/13 and 2015/16 and diesel emissions increased from 17% in 2012/13 to 19% in 2015/16.

The CCT's energy consumption picture continues to be dominated by fossil fuels, such as petrol, diesel and coal (in the generation of electricity). The use of fossil fuels not only present environmental and social risks, but also contribute to GHG emissions that are driving climate change and intensifying global social, environmental and economic vulnerabilities. Economic vulnerability is another risk that the CCT carries from its dependency on fossil fuels. This includes supply chain disruptions, such as climatic impacts (such as extreme weather events), resource shortages, war/unrest or sanctions as well as economic costs associated with a global carbon pricing regime.

Tracking energy and emissions over time

The CCT has pioneered local energy data collection and collation that goes back to 2003. Table 8 provides insight into the energy and emissions profile for the CCT intermittently over the period 2003 – 2015/16.

Table 7 - Energy and energy related CO_2e emissions comparison in Cape Town (2003 – 2015/16)

	2003[20]		2007[21]		2009		2012/13		2015/16	
	GJ	CO_2e	GJ	CO_2e	GJ	CO_2e	GJ	CO_2e	GJ	CO_2e
Electricity	38 835 284	11 256 863	48 576 102	14 844 856	48 303 379	12 852 578	46 418 387	13 280 816	47 093 274	13 473909
Coal	3 831 352	361 680	3 055 991	288 485	3 055 991	277 011	2 636 763	212 642	2 636 736	212 640
Petrol	40 687 369	2 815 566	39 392 694	2 725 974	41 620 196	2 787 329	46 227 071	3 099 933	45 531 977	3 053 321
Diesel	20 127 757	1 487 441	27 874 053	2 059 892	30 064 496	2 308 944	48 601 518	3 546 579	56 392 637	4 115 138
Paraffin	2 448 769	175 579	2 830 399	202 939	2 034 767	145 617	2 435 504	174 544	2 477 326	177 542
LPG	684 970	43 153	1 750 168	110 260	3 748 138	132 756	2 631 231	170 714	1 919 524	116 174
HFO	4 695 842	362 519	4 116 143	317 766	3967 139	293 522	1 242 311	93 173	1 083 438	81 258
Jet Fuel	-	-	16 082 323	1 153 103	18 338 382	1 063 279	13 590 759	793 713	148 33 006	866 261
Aviation Gas	-	-	-	-	46 892	2 316	26 006	1 287	4649	230
TOTAL	**110 231 787**	**16 502 801**	**143 727 451**	**24 368 389**	**151 179 379**	**19 869 351**	**163 809 550**	**21 373 421**	**171 972 570**	**22 096 474**

The table above shows a consistent increase in energy consumption between 2003 and 2015/16. The electricity consumption has remained lower than the period between 2007 and 2009, but a significant increase in diesel consumption has impacted on the overall energy consumption increasing. It should be noted that the data collection methodology and analysis used by the CCT and WCG do differ to some extent, so the numbers may not align completed when presenting the data.

20 Cape Town 2011 : State of Energy and Energy Futures Report

21 Cape Town 2011 : State of Energy and Energy Futures Report

Sector Disaggregation

Cape Town's energy picture is dominated by the transport sector at 68%, which is consistent with the energy profile in metropolitan municipalities across the country. This is followed by industry (13%) and the residential sector (12%). This is due to most of the Western Cape's population residing in the Cape Town area and much of the economic activities taking place in the region, it is expected that transport related activities make up the majority of the energy consumption mix in the region.

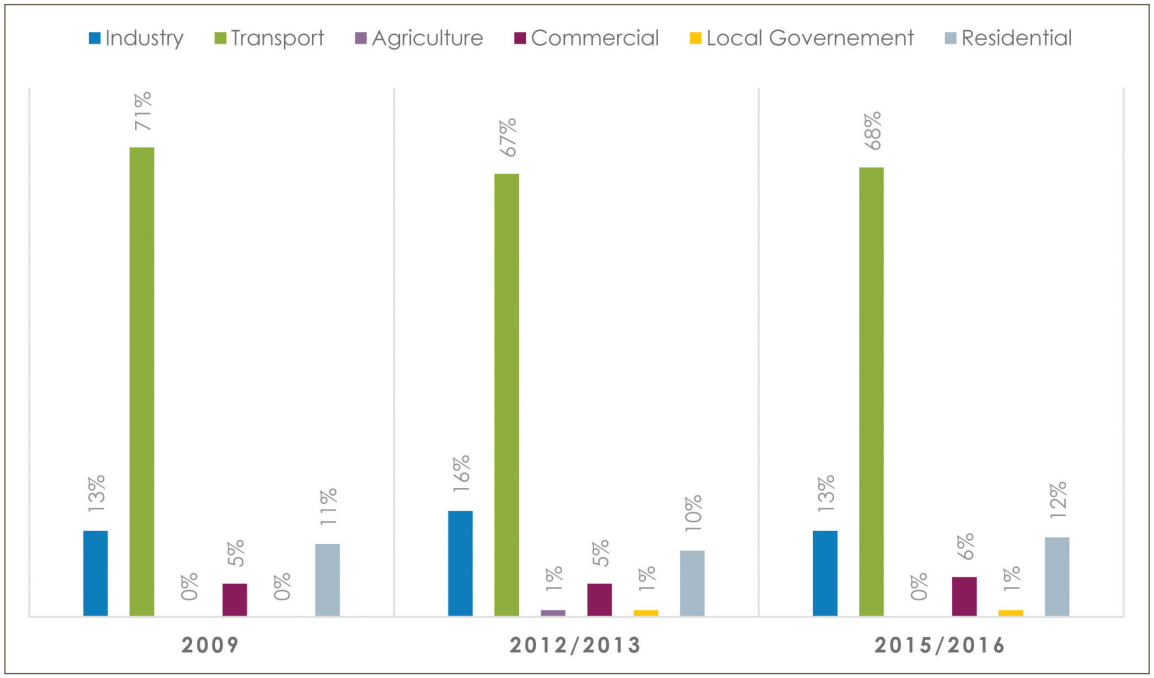

Figure 11 - Energy consumption by sector for City of Cape Town (GJ) – comparing 2009, 2012/13 and 2015/16

In terms of GHG emissions, the transport sector accounts for 37% of the total energy related emissions in the City, followed by the industrial and residential sectors, both at 24%. It is important to note that although the transport sector consumes 68% of energy in the CCT, the emissions contribution will be lower due to the carbon potential of liquid fuels being lower than those for coal-based electricity.

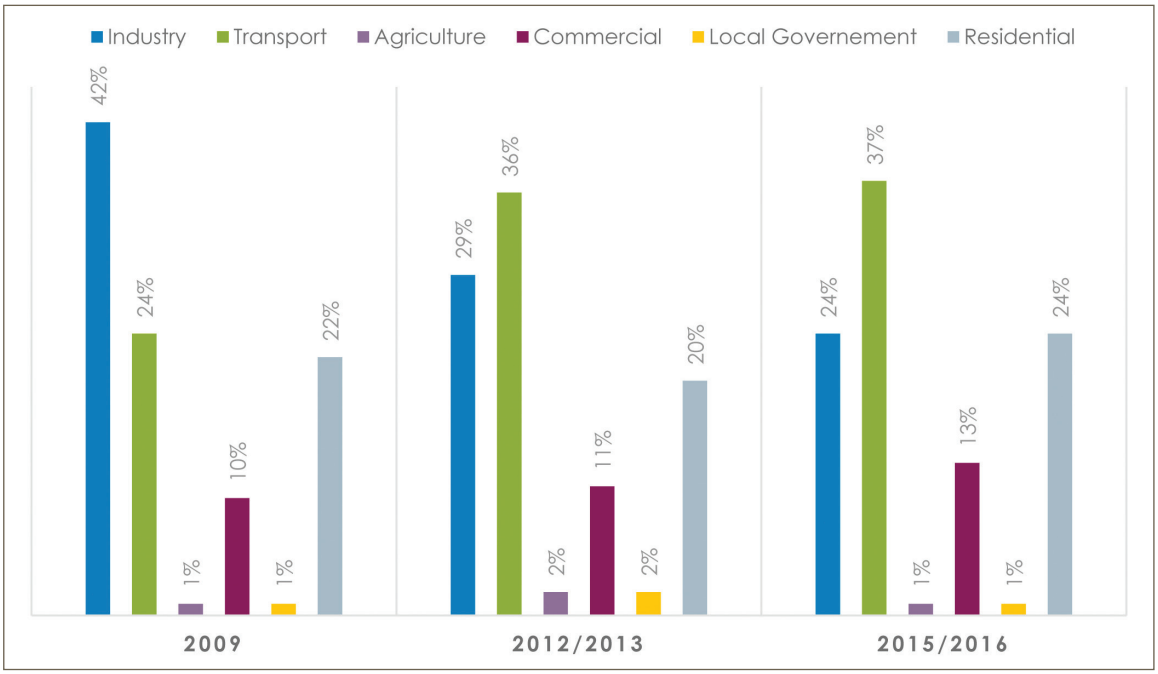

Figure 12 - Emissions by sector for City of Cape Town (tCO_2e) – comparing 2009, 2012/13 and 2015/16

As one of the single largest fuel sources, it is worth disaggregating the electricity profile across the City of Cape Town. Figure 13 below shows the consumption of electricity by sector. The major consumers of electricity are the residential (38%), industrial (37%) and commercial (21%) sectors.

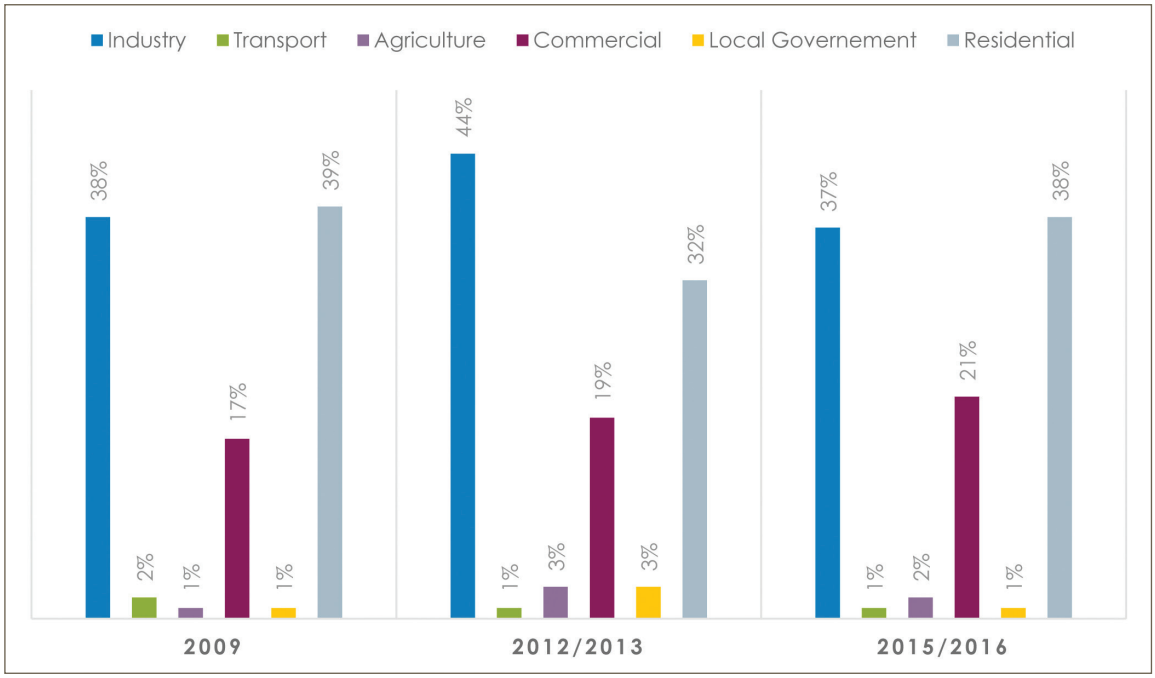

Figure 13 - Electricity consumption by Sector for City of Cape Town (kWh) – comparing 2009, 2012/13 and 2015/16

Electricity consumption by the industrial and residential sectors (in terms of proportional contribution) has decreased for the industrial sector from 44% in 2012/13 to 37% in 2015/16 while the residential sectors contribution has increased from 32% in 2012/13 to 38% in 2015/16. The decrease in consumption in the industrial sector could be linked to the implementation of a range of energy efficiency initiatives and awareness programmes and a shift to alternative energy sources, due to load shedding experienced during this period. Although energy efficiency programmes are being implemented across sectors and being encouraged specifically in the residential sector, the impact thereof is not yet evident in the electricity consumption figures of the residential sector. The expected decrease in household electricity use will most likely be evident over a longer time period. The residential sector, however, remains important as it is a key contributor to morning and evening peak usage, as well as contributing fairly substantially to municipal electricity revenue. There is also anecdotal evidence that investment by households and business into energy saving has decreased as a result of the water supply constraints having increased; with investment now being channelled into water storage and saving technologies.

Energy savings activities in the City of Cape Town

As the largest consumer of energy in the Western Cape, the CCT is progressively pursuing and promoting the green economy and continues to implement and plan for a low carbon society. Leading by example, the Energy Efficiency in City Buildings' project aims to reduce the operating costs of the City's office buildings in order to decrease the use of electricity and thus reduce associated emissions. The project involved the rollout of over 450 smart meters to monitor consumption, and also retrofit initiatives such as energy efficient lighting, solar water heaters, HVAC, solar PV and educating building managers and occupants about the project. Through this project, the CCT is saving 6 865 MWh of electricity and 5 796 tonnes of CO_2 annually. The CCT has retrofitted 18 of its buildings with energy efficiency technologies and an additional 11 have been retrofitted with LED lighting and motion sensors which has saved the City 5 225 MWh annually[22].

22 Ref: http://www.capetown.gov.za/departments-city-initiatives/environmental-resource-management/energy-efficiency-in-city-buildings-project

Other programmes include the ceiling retrofit for previously built low income housing stock, the promotion of the SWH accreditation programme, allowing small-scale embedded generation, including the implementation of appropriate tariffs, and the planned inclusion during 2018 of electric buses as part of the MyCiti fleet.

CAPE WINELANDS DISTRICT MUNICIPALITY

Overview of the Municipal Area

The Cape Winelands District comprises of Breede Valley, Drakenstein, Langeberg, Stellenbosch and Witzenberg municipalities. The district is widely known for its wine production and is a popular domestic and international tourist destination, both activities contributing significantly to the economy of the Western Cape. The Cape Winelands is the most populous district outside the Cape Town metro in the Western Cape, with a population of 866 223[23].

The sectors driving the economy in the region is finance, insurance, real estate and business services sector; the manufacturing sector, and the wholesale and retail trade, catering and accommodation sector (MERO 2017). Major economic activities taking place in the region include; 1) tourism; 2) agriculture; 3) manufacturing; and 4) community, personal and social services.

The Energy Picture

The Cape Winelands district accounts for 7% of the provincial energy consumption and 9% of the GHG emissions in the province.

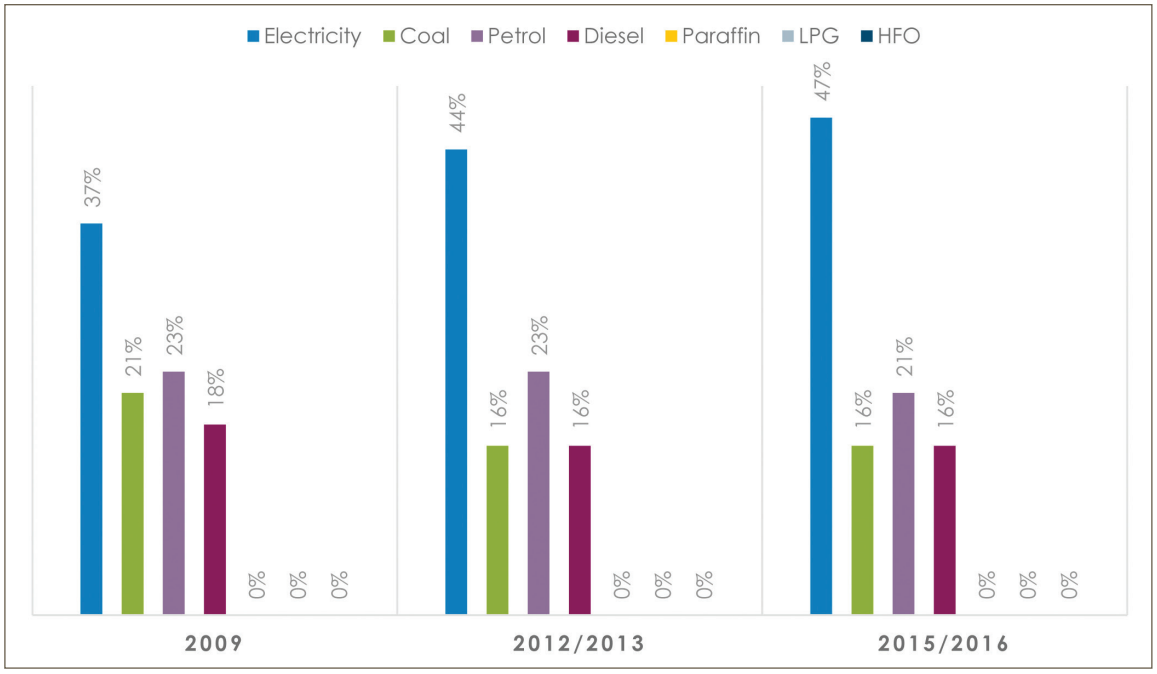

Figure 14 - Energy consumption by fuel type for Cape Winelands (GJ) – comparing 2009, 2012/13 and 2015/16

23 Socio-Economic Profiles 2016: Cape Winelands District

The energy picture for the district shows that the district is solely reliant on fossil fuel based energy which are dominated by electricity, petrol, diesel and coal. The dependence on fossil fuel renders the district vulnerable to price increases and shocks, supply disruptions and possible costs associated with carbon pricing in the future.

Electricity accounts for 47% of the energy consumed in the district, with transport fuels (petrol and diesel) account for a combined 37%. Coal is the only other major contributing fuel. The electricity consumption has remained mostly consistent over the last three periods, with decreases in coal, petrol and diesel being experienced. The total consumption has steadily decreased since 2009.

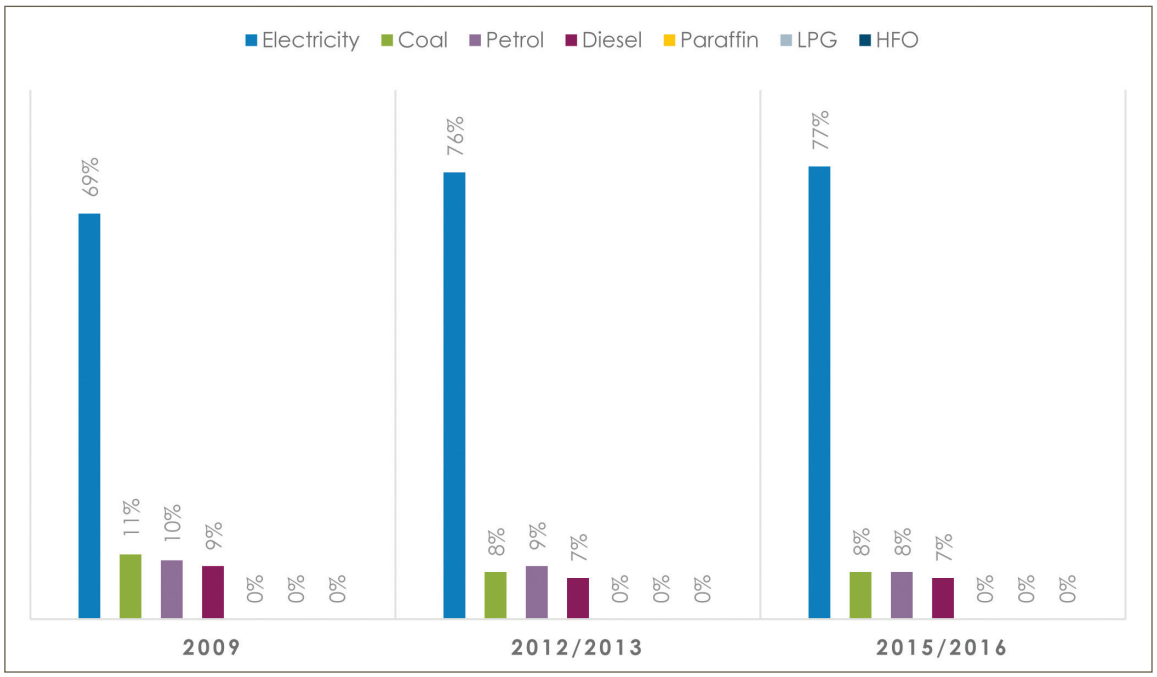

Figure 15 - Emissions by fuel type for Cape Winelands (tCO_2e) – comparing 2009, 2012/13 and 2015/16

Although electricity accounts for just under 50% of the energy consumption, it accounts for over 75% of emissions in the district and dominates the emissions profile for the district. The use of coal to generate most of the electricity in South Africa, impacts the emissions profile of electricity.

Sector Disaggregation

The transport sector has remained the dominant consumer of energy followed by the industrial and residential sectors. Transport plays an important role in the district's economy which includes exports (wine, fruits and other manufactured goods) and a large contribution to tourism in the province.

As stated above, the total energy consumption for the district has decreased consistently since 2009. Several factors have played a role in the reduction in energy consumption including increasing fuel costs, the impact of load-shedding and greater awareness and implementation of energy efficiency and renewable energy technologies. The impact of the drought on the agricultural sector has also caused adverse impacts on industrial and transport sectors as the region's economy is mostly agriculture drive with various local sectors providing support to the agricultural sector.

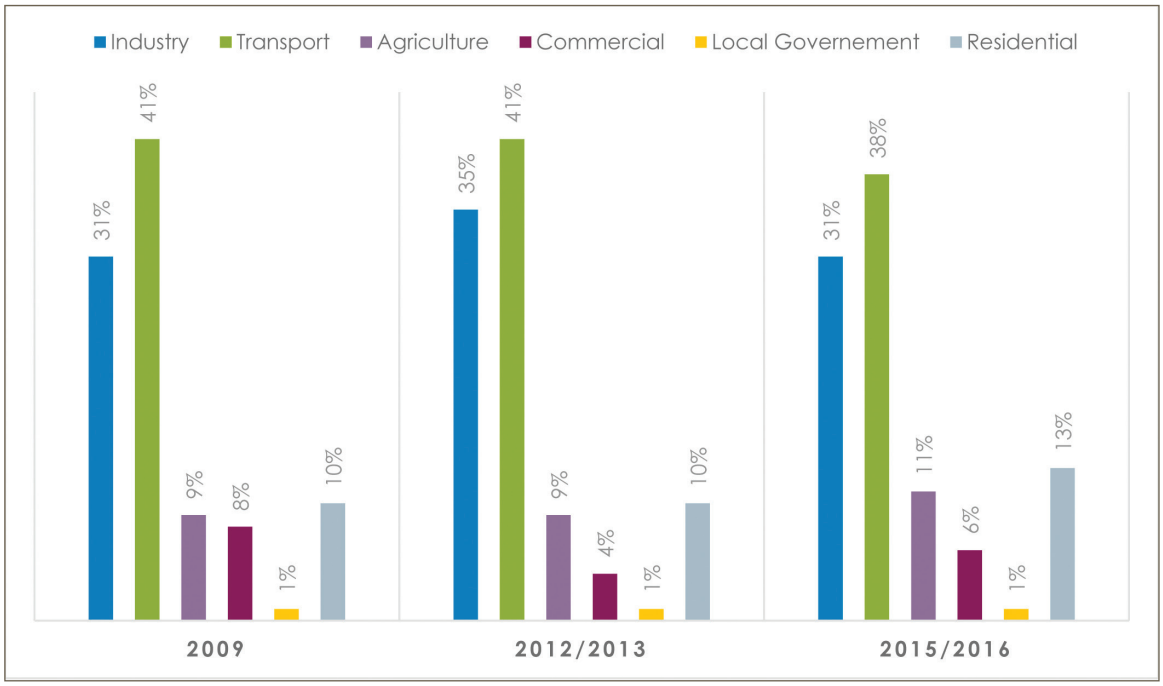

Figure 16 - Energy consumption by sector for Cape Winelands District (GJ) – comparing 2009, 2012/13 and 2015/16

The emissions picture indicates that Industry (31%) is the largest emitter in the district, followed by the residential (31%) and agricultural (18%) sectors. The sectors that have the greatest potential for emissions reductions include the residential, commercial and industrial sectors. It is important to focus on these sectors to ensure and enforce opportunities to achieve a sustainable built environment. If not addressed the sector can suffer from risks associated with increased energy prices, carbon taxing and security of supply. It is also worth assessing the agricultural sector in more detail in order to understand and evaluate the efficiency potential of this sector.

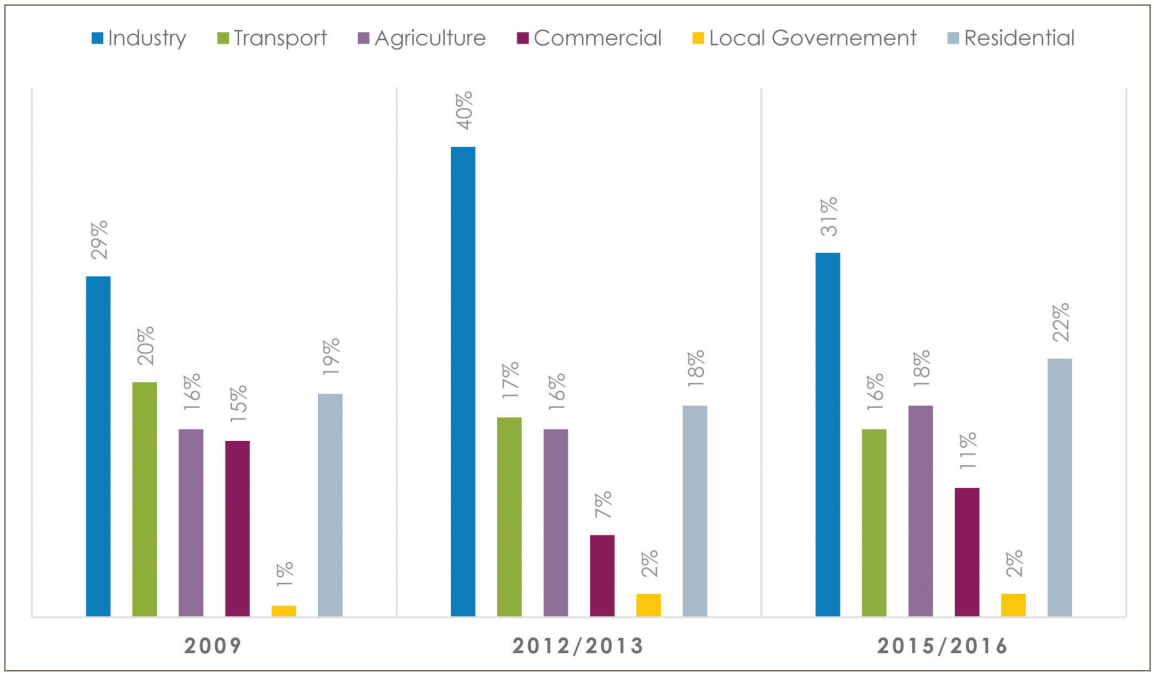

Figure 17 - Emissions by Sector for Cape Winelands (tCO_2e) – comparing 2009, 2012/13 and 2015/16

Industry remains the highest consumer of electricity (31%) followed closely by Residential (29%) and Agriculture (23%). Total electricity consumption has decreased for the district, but there have been some changes in the proportional contribution. The changes in the commercial sector can be attributed to the increased economic contribution of the sector as well as change in tariff allocations and how sectors are classified by the municipalities.

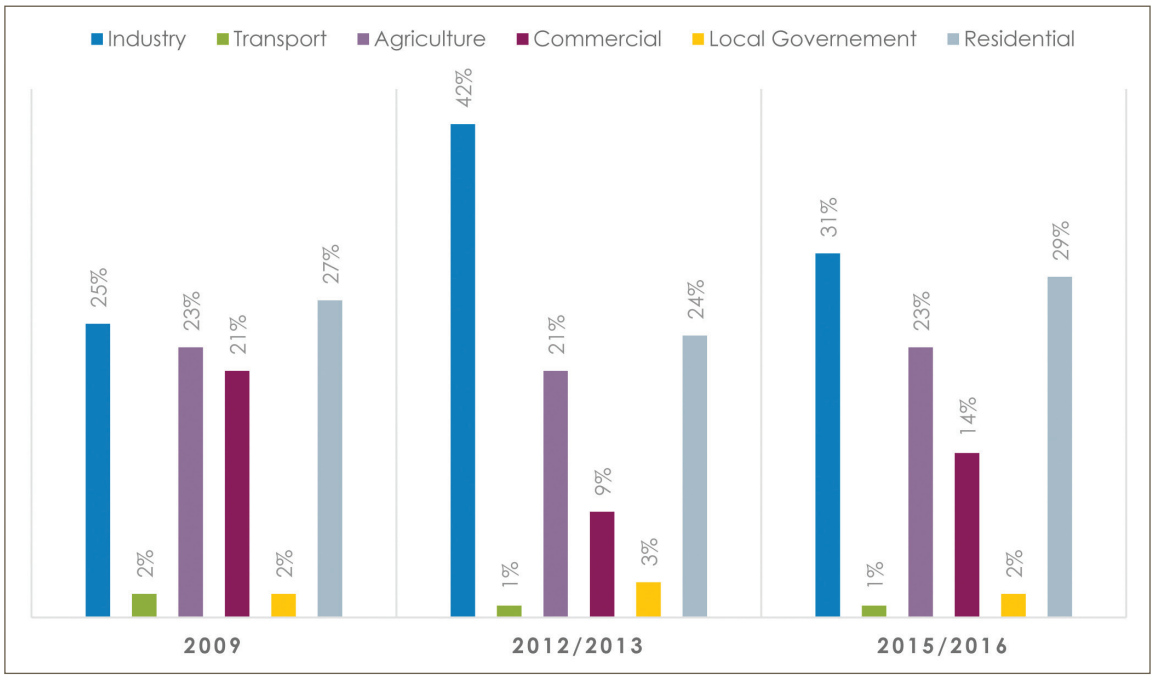

Figure 18 - Electricity consumption by sector for Cape Winelands (kWh) – comparing 2009, 2012/13 and 2015/16

To decrease energy consumption through the District, local municipalities have implemented initiatives such as Solar Water Heating systems with new low cost housing being prioritised to include these systems, the Ripple Geyser Control Geyser to manage load, and wonder bags hand-outs. The District has promoted and installed energy efficient technologies in municipal office buildings such as replacing air conditioners with eco-friendly, inverter energy-efficiency air conditioners and energy saving bulbs and light fittings being replaced on an ongoing basis.

Larger industries in the district also makes use of solar energy such as the Villiera Wines who installed solar power to supply the winery with its day time energy requirements outside of harvest time. The system is able to generate 132 KW of power. The Aquila Private Game Reserve installed a 60 kW capacity CPV system to generate 1 735 660 kWh per year.

Wind Energy.Albert Achurst. Western Cape Government: Department of Environmental Affairs and Development Planning.

WEST COAST DISTRICT

Overview of the Municipal Area

The West Coast District is well known for its coastal beauty and is made up of five local municipalities: Matzikama in the north, Cederberg in the centre, Bergrivier, Saldanha Bay and Swartland in the South and is situated north from the City of Cape Town. The District covers an area of 31 124km^2 and accommodates a population of 436 403 people[24].

All five districts have access to the Atlantic Ocean which makes the West Coast district a popular holiday destination and a small scale fishing hub (commercial fishing is also popular in the region). The N7 national highway connects all the municipalities in the district with the exception of Saldanha Bay. The West Coast District serves as a strong regional development corridor linking the City of Cape Town with the economies of Namibia and Angola. In addition, the district presents enormous potential in the areas of tourism, oil and gas, aquaculture and renewable energy (wind, solar, wave).

Contributing 5.1 per cent towards the Western Cape economy[25], the major economic activities taking place in this region include: 1) finance, insurance, real estate and business services; 2) manufacturing; 3) agriculture, hunting, forestry and fishing; and 4) tourism[26]. As with many of the districts in the Western Cape, the drought conditions combined with the consistent rise in fuel prices and a volatile rand will continue to have negative impacts on the economy of the District[27].

The Energy Picture

The energy picture in the West Coast is dominated by coal use for industrial purposes. The coal consumption has decreased since 2009, although it is slightly higher than consumption levels in 2012/13. The electricity consumption has increased since 2009, although there was a decrease in 2012/13. Because of the dominance of coal in the energy, the transport fuels (petrol and diesel) have a very small contribution to the energy mix. Understanding sectoral contributions to energy consumption and emissions enables effective energy management. It assists in identifying the sectors in the district that will be affected by the development costs related to energy supply and use and, to this end, enables targeted policy development.

It is important to note that the West Coast would likely have had a similar energy consumption and carbon emissions profile relative to the other districts in the province were it not for the large amount of energy intensive industrial activities in the district.

As is evident from the data that the district remains heavily dependent on fossil fuels, particular coast use and coal-based electricity generation. This very low level of fuel diversification on which the economic production of the region depends presents a potential serious threat to its future economic production.

24 Socio economic profiles 2016: West Coast District.

25 MERO 2017

26 West Coast Annual Report 2015/2016

27 MERO 2017

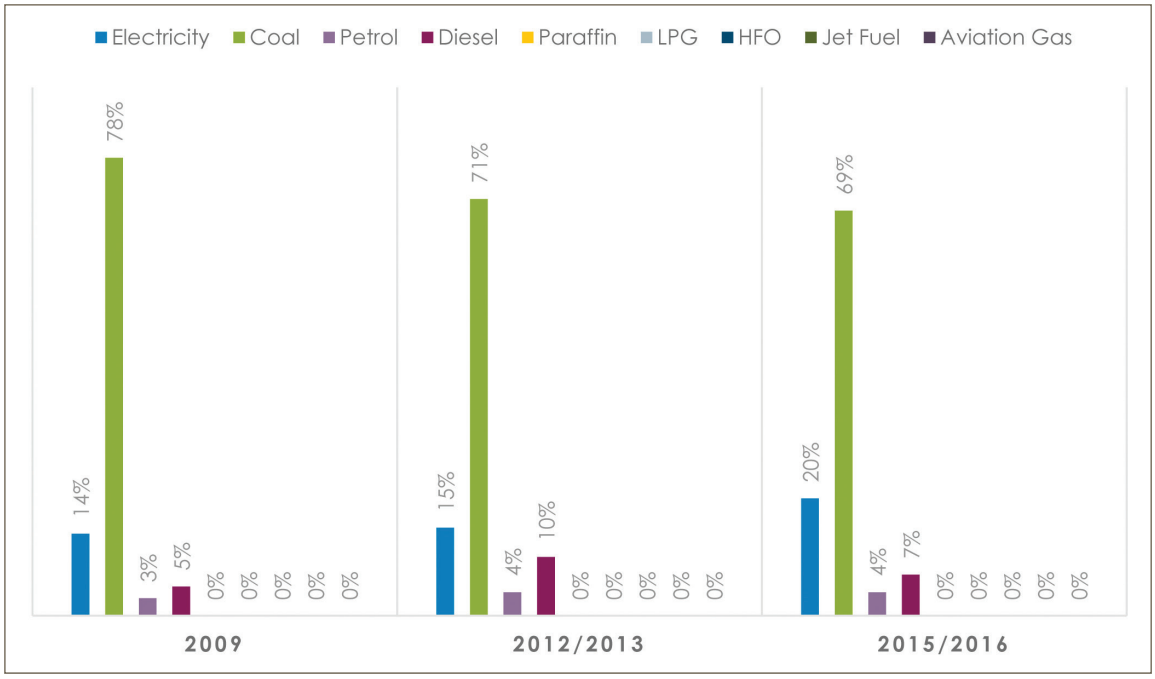

Figure 19 - Energy Use by Fuel for the West Coast District (GJ) – comparing 2009, 2012/13 and 2015/16.

Although energy consumed by electricity accounted for only 20% of the overall consumption, the high emission factor of fossil fuels accounts for 47 % of the emissions in the district for electricity. The emissions from coal however has decreased from (52%) during 2012/13 to 47% during 2015/16, equalling the emissions figure from electricity during the same period.

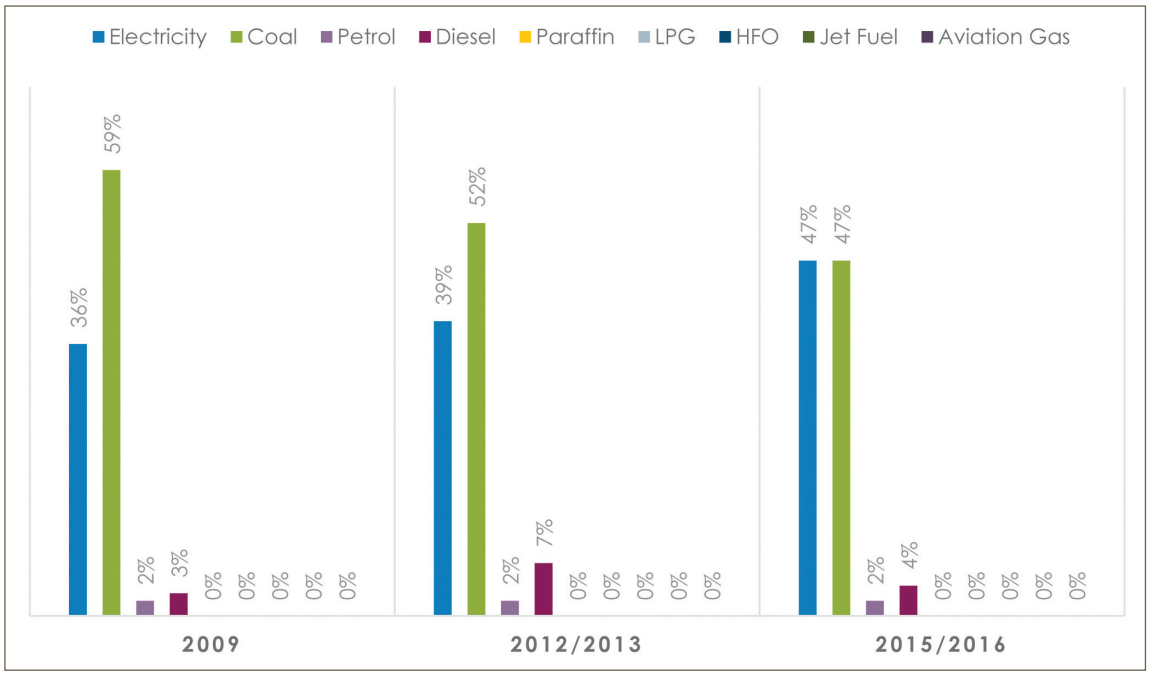

Figure 20 - Emissions by fuel type for the West Coast District (CO_2e) – comparing 2009, 2012/13 and 2015/16

Sector Disaggregation

The industrial sector dominates the energy picture accounting for a huge proportion (82%) of energy consumed in the district compared to the 78% consumed during 2012/13. This is attributed to ongoing energy-intensive heavy industrial activities in the region. Similarly, the industrial sector stands out as the major carbon emitting sector (76 %) with a significant increase in emissions from 65 % during 2012/13. This figure is due to the intensive use of coal and electricity.

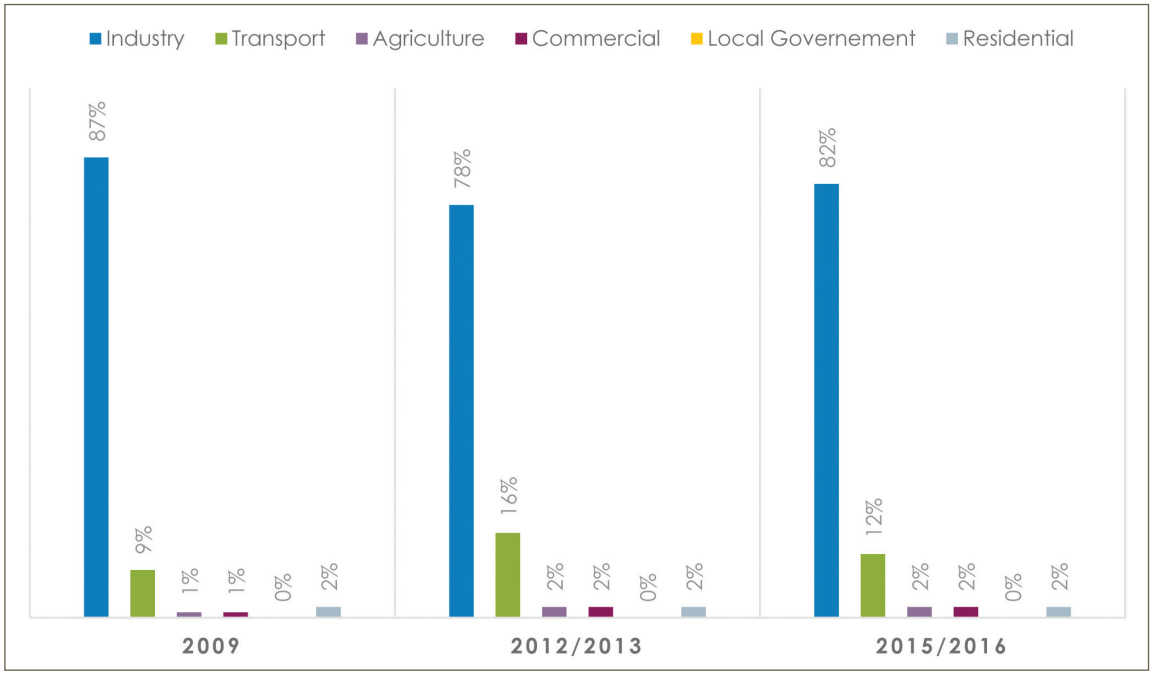

Figure 21 - Energy Consumption by Sector for West Coast (CO_2e) – comparing 2009, 2012/13 and 2015/16

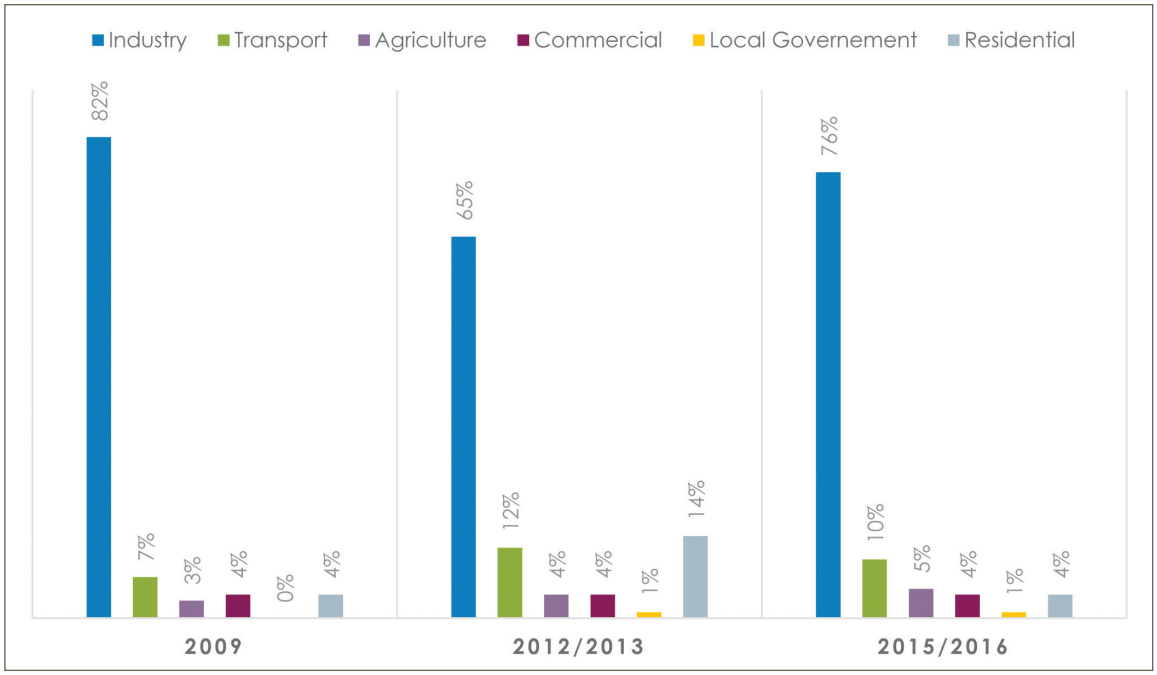

Figure 22 - Emissions by Sector for West Coast (CO_2e) – comparing 2009, 2012/13 and 2015/16

Given the importance of electricity in the emissions profiles, it is important to understand how electricity is used in each sector and identify opportunities for the efficiency potential of these sectors. Industry accounted for 63% of the total electricity consumption in the district. This is due to growing developments and intensive use of electricity in the industrial sector of the district.

The residential, commercial and agricultural sectors all contribute approximately 10% to the electricity use profile in the district. These sectors together with the industrial sector are key areas where energy efficiencies can be realised.

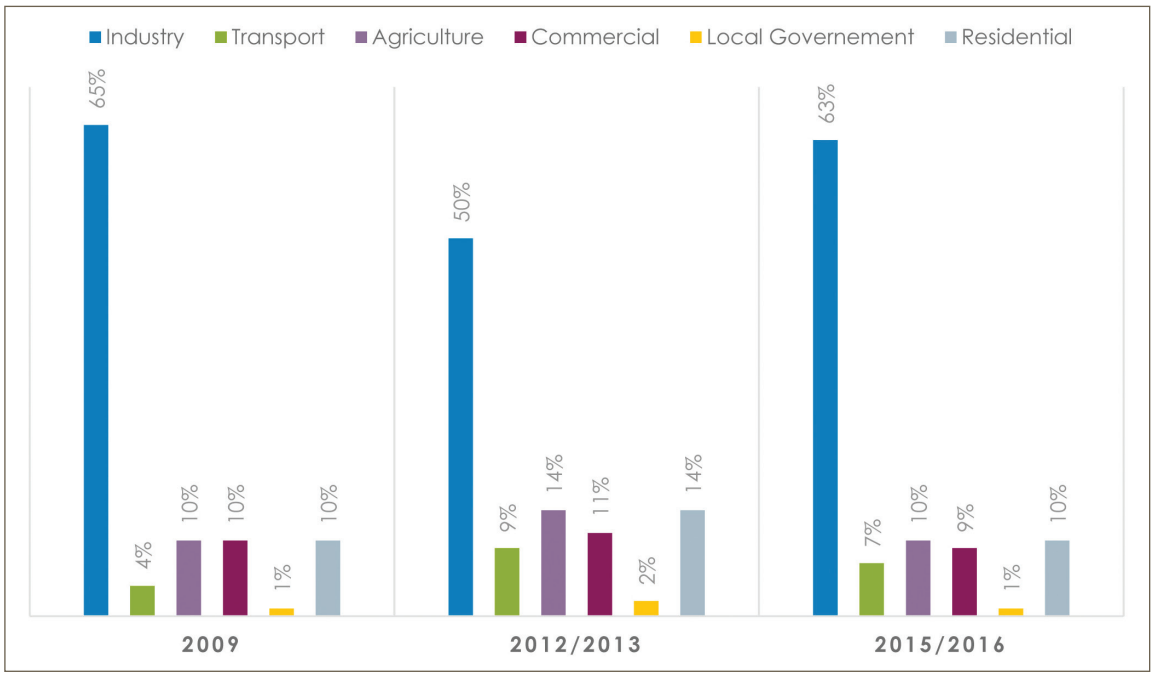

Figure 23 - Electricity consumption by sector for West Coast (kWh) – comparing 2009, 2012/13 and 2015/16

The West Coast District municipality houses several large scale solar and wind energy projects which includes, the Aurora-Rietvlei Solar Power (RF) (Pty) Ltd, the Paleisheuwel Solar PV Park, the Solar PV Slimsun 5MW Darling Plant, De Bron Complex 50kW Rooftop Photo Voltaic grid tied plant, the Hopefield Wind Farm and the Darling Wind farm.

Swartland municipality has reduced their electricity consumption by targeting popular sports filed in the municipal area through the installation of 2 x 200 litre solar water heaters in three sports fields, located in Moreesburg, Darling and Malmesbury. Other initiatives include, Energy efficient Streetlights, Municipality Buildings Retrofit Stage lights, Municipality Flats retrofit, Municipality Buildings Retrofit CFL lamps, Municipal City Hall Air conditioning and (27) small-scale embedded generation projects. Swartland municipality also distributed wonderbags, installed solar heaters and manages the energy load by means of remote control of consumer geysers.

OVERBERG DISTRICT

Overview of Municipal Area

The Overberg District is located in the south of the Western Cape and bounded by the Indian and Atlantic Oceans to the South and Cape Town, Cape Winelands District and Eden District in the west, north and east. It comprises four local municipalities: Cape Agulhas, Overstrand, Theewaterskloof and Swellendam. The District covers an area of over 11 391km^2 with a population of 215 734. It is the smallest district in the province, making up 9% of the Western Cape geographical area.

The main economic sectors in the district include financial and business services, manufacturing and agricultural activities. The district has a rural and agricultural profile although some larger towns as Grabouw, Caledon, Hermanus and Swellendam are found in the region.

The Energy Picture

The Overberg District is contributing 2% to the total energy consumption profile for the Western Cape, so the changes and efficiencies made in the district, although important, will have a very small impact on the overall energy and emissions profile for the province.

Although electricity dominates the energy mix for the district there has been a decrease in electricity consumption to below 2009 consumption levels. Coal consumption has increased, although this could be due to better quality data on coal use in industrial activities through the atmospheric emission license process, but this will need to be investigated in greater detail. Dependence on fossil fuels renders the district vulnerable to price increases and shocks, supply disruptions and possible costs associated with carbon pricing in the future.

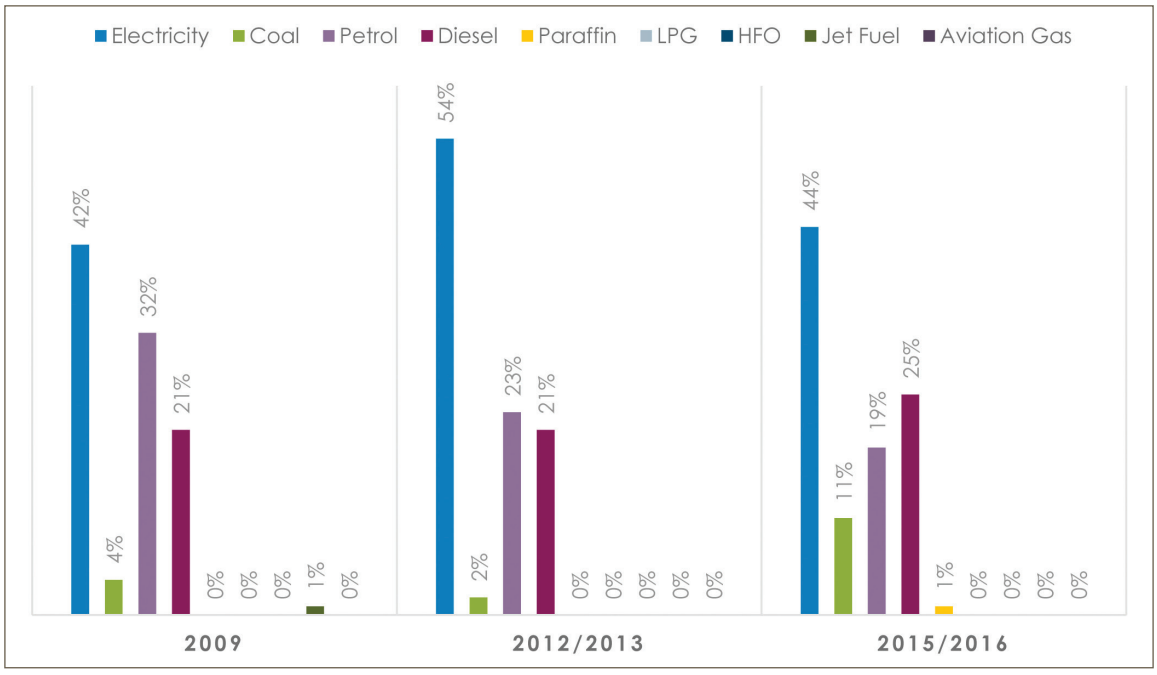

Figure 24 - Energy Use by Fuel Type for Overberg (GJ) – comparing 2009, 2012/13 and 2015/16

Electricity accounts for 75% of emissions for the district, although due to the decrease in electricity consumption the emissions have also decreased since 2012/13. Petrol, diesel and coal make up the bulk of the remaining emissions. The Overberg district has the highest contribution of electricity based emissions of all the districts in the Western Cape.

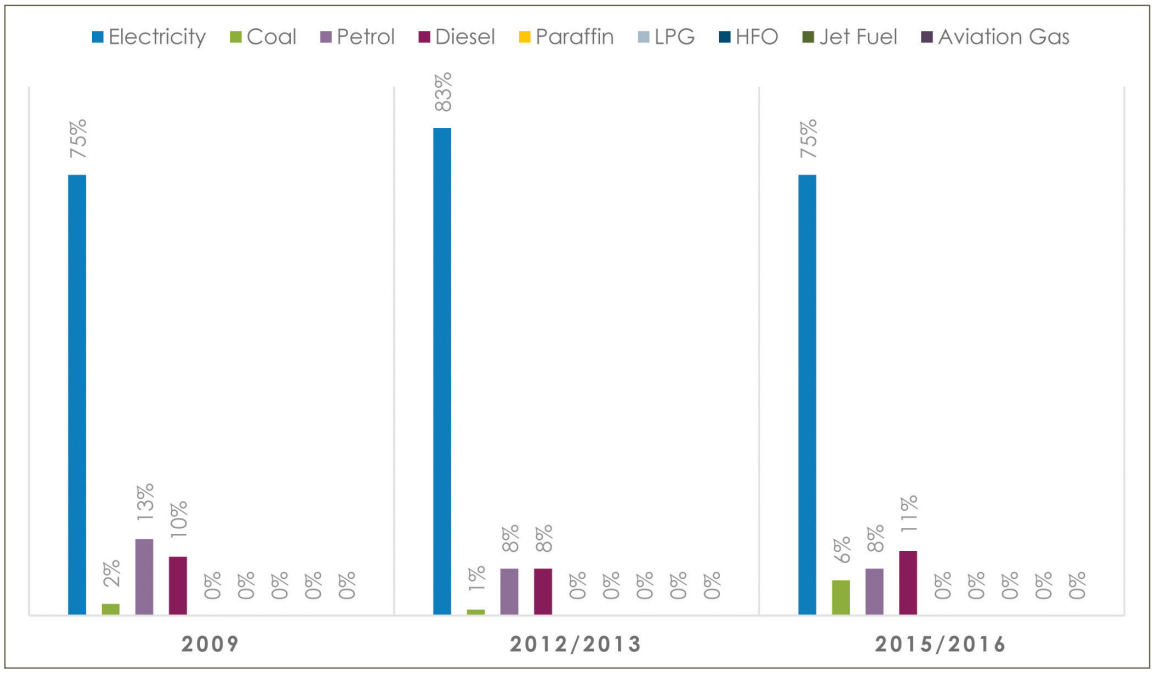

Figure 25 - Emissions by Fuel type for Overberg (CO_2e) – comparing 2009, 2012/13 and 2015/16

Sector Disaggregation

The transport sector dominates the energy profile for the district, followed by industrial and residential sectors. The high consumption of the agricultural sector in 2012/13 was an anomaly and the 9% proportional contribution in 2015/16 is a more accurate reflection of the sector's contribution.

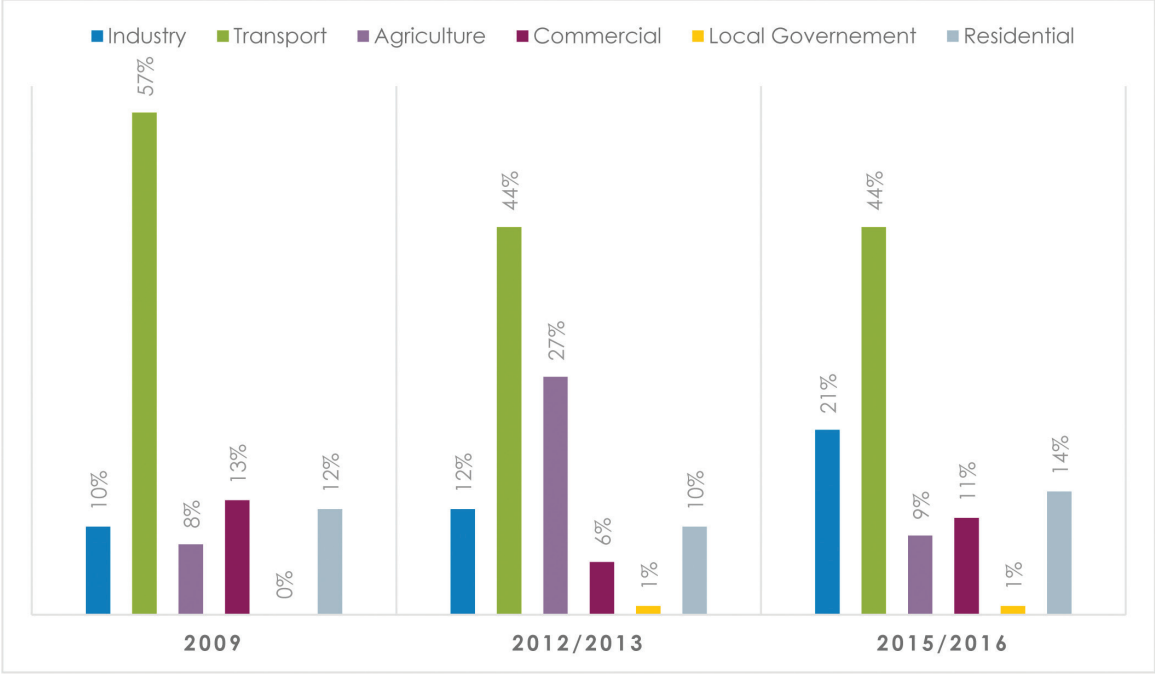

Figure 26 - Energy Consumption by Sector for Overberg (GJ) – comparing 2009, 2012/13 and 2015/16

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Due to the inaccurate agriculture figure for 2012/13, it is difficult to compare the 2015/16 data to the 2012/13 data. In terms of emissions, the residential and industrial sectors have the highest proportion of emissions associated with them, although most sectors are approximately 20% of the emissions. The built environment (residential and commercial sectors) is the key sector to manage in respect of carbon emissions due to its dependence on coal-based electricity generation. The emissions from transport fuels are associated with the N2 national highway and other key roads running through towns such as Caledon and Swellendam. It does make it difficult to make significant changes to the transport sector as it is outside the mandate of the municipality.

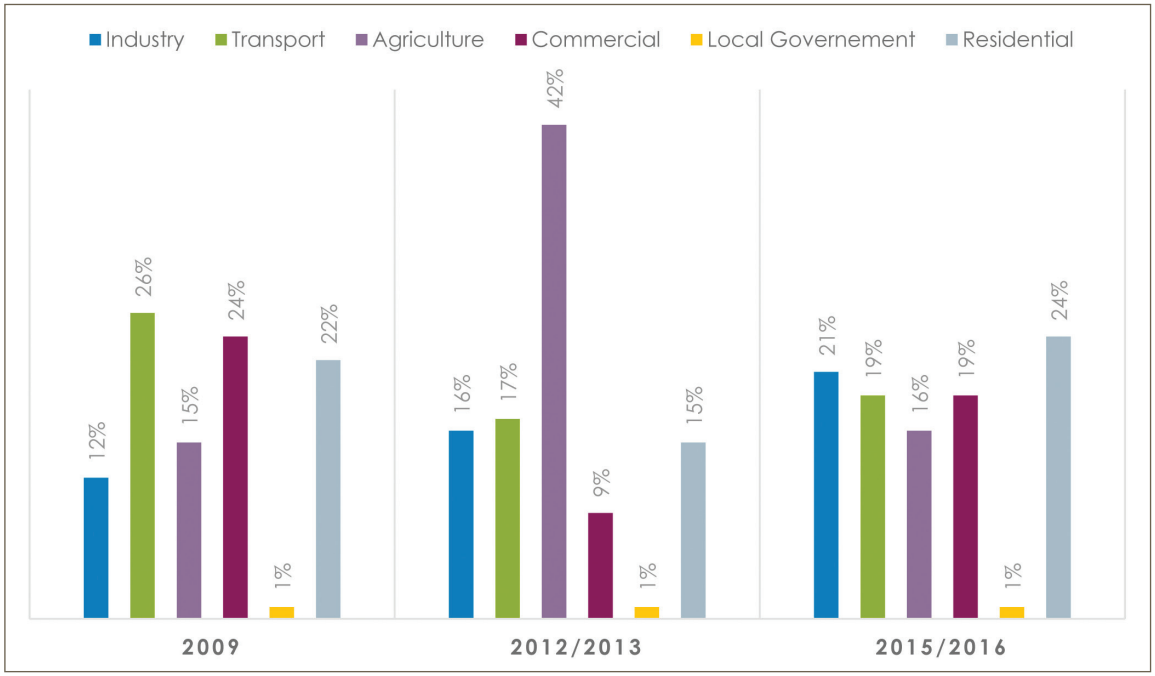

Figure 27 - Emissions by sector for Overberg (CO_2e) – comparing 2009, 2012/13 and 2015/16

The residential sector is the largest consumer of electricity in the district, followed by commercial, agricultural and industrial sectors. This is consistent with a municipal electricity breakdown around the country. Although overall electricity has decreased for the district, it is still the dominant energy source.

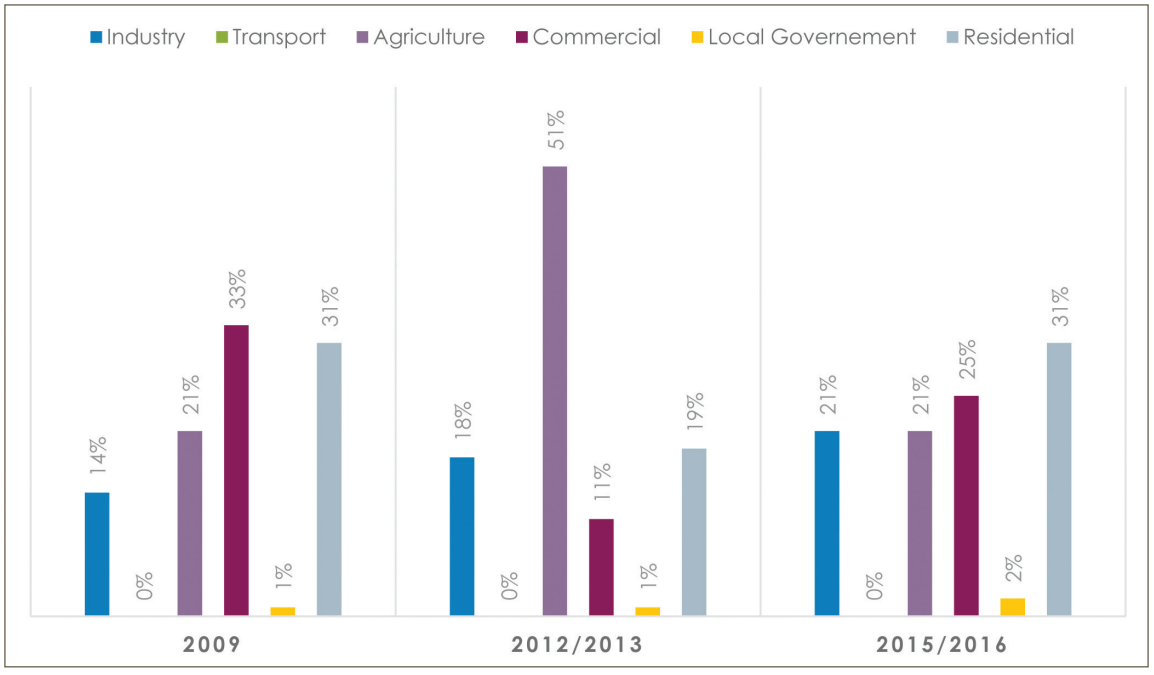

Figure 28 - Electricity consumption by Sector for Overberg District (kWh) – comparing 2009, 2012/13 and 2015/16

Table 8: Energy Efficiency and Renewable Energy projects implemented in the District

NAME	DESCRIPTION
Overstrand Load Control	6200 hot water cylinder load control units were installed in Franskraal, Hermanus, Sandbaai and Kleinmond areas between October 2011 and March 2014 to assist Eskom with load shifting during peak times. The municipality is currently switching off twice daily from Monday to Friday
Theewaterskloof SWH Programme	700 SWHs installed in mid-to-high income residential sector during 2012/13 and SWH installed on 80% (4000) of RDP houses
Dassieklip Wind Energy Facility	e Project, located on an area of approximately 350 hectares (the "Site"), has a nameplate capacity of 27MW, a maximum connection point capacity of 30MW, and comprised of 9 wind turbine generators

EDEN DISTRICT

Overview of Municipal Area

The Eden District is situated in the Western Cape Province with an estimated population of 574 265 in 2011 rising to 611 278 in 2016. The district comprises seven municipalities: Bitou, George, Kannaland, Knysna, Hessequa, Mossel Bay and Oudtshoorn. The Eden district covers an area of 23,331 km^2 in the south-eastern part of the Western Cape, covering the regions known as the Garden Route and the Little Karoo. It stretches from the Breede River mouth and the Langeberg mountains on the west, where it abuts the Overberg District Municipality and (for a short distance) the Cape Winelands District Municipality. To the north the boundary with the Central Karoo District Municipality runs along the Swartberg mountains. In the east the municipality runs up to the Eastern Cape provincial boundary.

The district experiences high levels of unemployment and inequality. In 2011, approximately 22.4% of the working population were unemployed and a quarter of the population are living in poverty[28].

The main economic sectors include finance and business services, tourism related activities, construction and agriculture related activities. The retail and construction sectors are major employers in the district. Another key sector is tourism, which has a particular set of energy, water and waste management challenges, due to the tourism-driven season peaks. This means that the distribution infrastructure and supply demands have to be able to cope with these seasonal peak demands that are far higher than the yearly average demands.

The Energy Picture

There has been a significant increase in diesel consumption between 2012/13 and 2015/16. A more detailed assessment of diesel use in the area needs to be undertaken in order to understand this increase. Electricity and petrol consumption has remained constant over the three reporting periods. There has also been an increase in coal consumption between 2012/13 and 2015/16, but this could be due to better quality reporting and data availability in terms of the Atmospheric Emissions Licenses. Other than jet fuel, which is used on the numerous national and private air fields in the region, the other fuels do not make a significant impact on the fuel use profile.

28 2014/15 Final Draft Reviewed IDP for Eden District Municipality

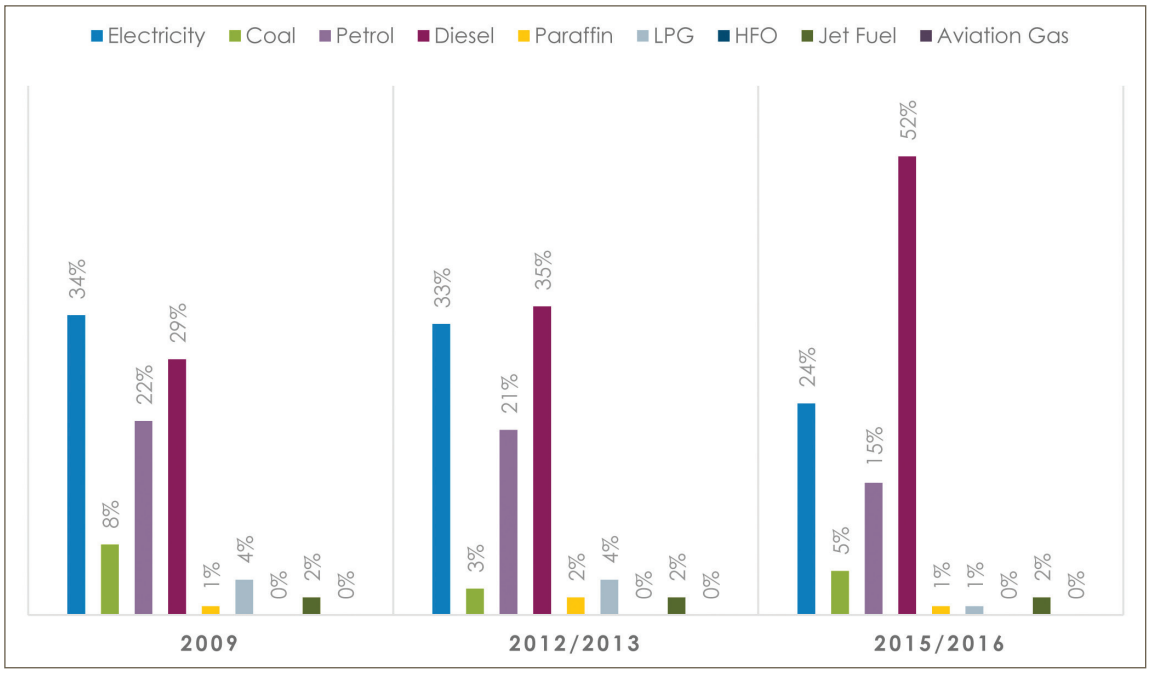

Figure 29 - Energy Use for by type for Eden District (GJ) – comparing 2009, 2012/13 and 2015/16

Electricity dominates the emissions profile in the district, due to most of South Africa's electricity coming from coal-fired power stations. The significant increase in emissions from diesel is linked to the increased consumption of diesel during the last reporting period. Due to the petrol consumption remaining constant, the emissions contribution has decreased in relation to diesel.

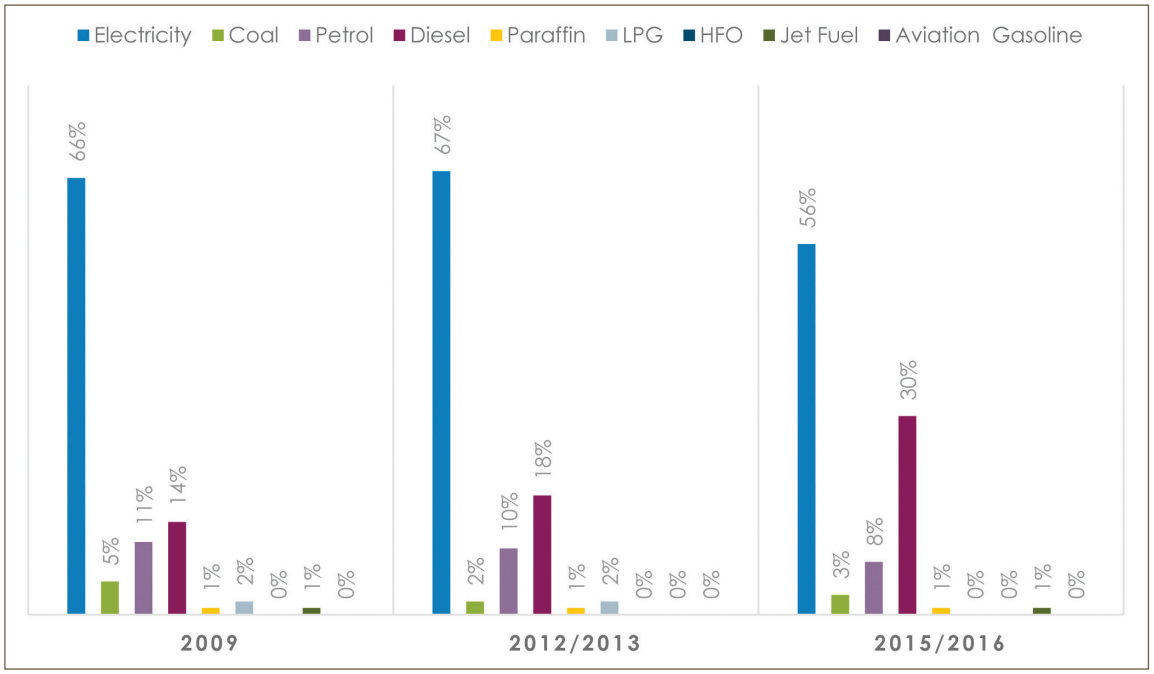

Figure 30 - Emissions by Fuel type for Eden (tCO_2e) – comparing 2009, 2012/13 and 2015/16

Sector Disaggregation

The transport sector accounts for the largest proportion of energy consumption in the district due to a number of key national and provincial roads situated in the district. these are in many cases key freight routes for the region and the country. The industrial sector is the 2nd largest consumer of energy in the region, particularly associated with the industrial activities taking place in the Mossel Bay and to a lesser extent George area, including the PetroSA facility in Mossel Bay. The residential sector is the 3rd largest consumer of energy and some of this consumption can be associated with accommodation for the tourism industry.

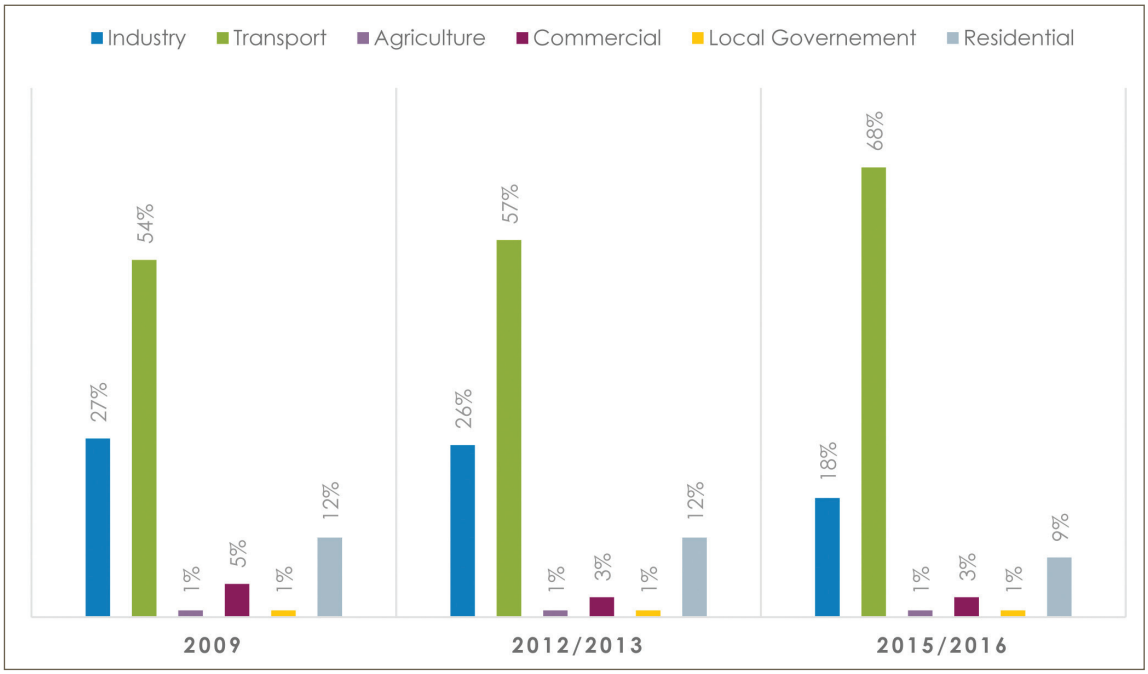

Figure 31 - Energy use by sector for Eden (GJ) – comparing 2009 and 2012/13 and 2015/16

Understanding sectoral contributions to district emissions enables effective management for reducing sectoral carbon emissions. The industrial, transport and residential sectors provide opportunities for emission reduction and efficiency programmes. Although most of the activities in the transport sector are outside the mandate of the local and district municipalities to implement. The transport sector is the largest contributor to emissions in the district, followed by the industrial sector. This differs from the picture in 2009 and 2012/13 when industry dominated the emissions picture. This is due to the significant increase in diesel consumption during 2015/16, but this needs to be investigated in greater detail.

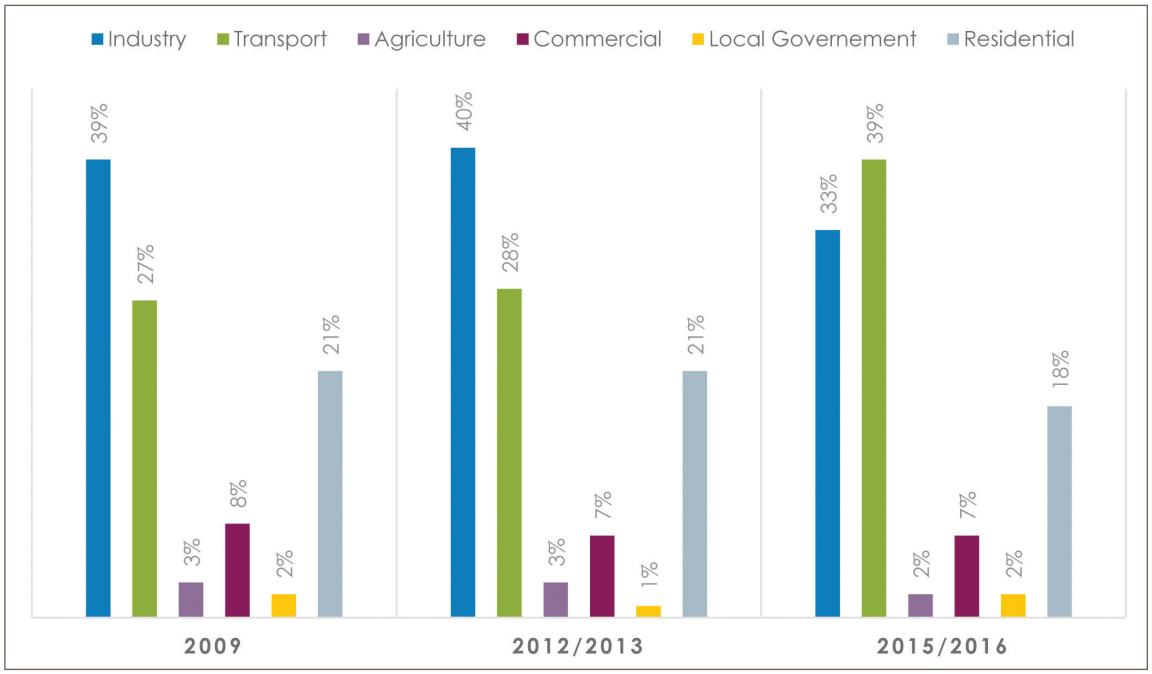

Figure 32 - Emissions by sector for Eden (CO_2e) – comparing 2009, 2012/13 and 2015/16

Electricity is a significant fuel on its own, due to its proportionally higher contribution to emissions. In the Eden district municipality, the industrial sector is the biggest consumer of electricity followed by residential and commercial sectors. This is due to the fact that these three sectors are strongly reliant on electricity. The breakdown has remained relatively consistent over the three reporting periods. There are a number of efficiency opportunities that can be put in place to reduce the consumption by these sectors.

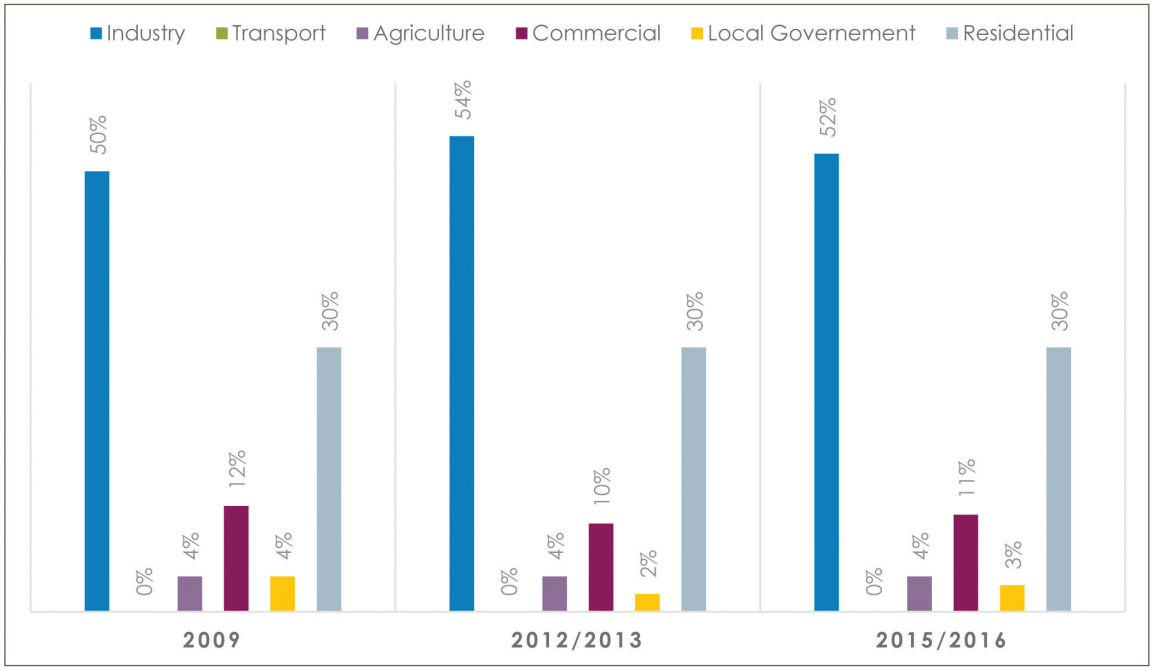

Figure 33 - Electricity consumption by sector for Eden (kWh) – comparing 2009, 2012/13 and 2015/16

Table 9: Energy Efficiency and Renewable Energy projects implemented in the District

NAME	DESCRIPTION
Bitou SWH Programme	200 SWHs installed in Bitou in mid-to-high income residential sector during 2012/13
George Human Settlements SWH Programme	395 SWHs installed during 2012/13
George Municipality EE Lighting	All municipal buildings have been converted to energy efficient lighting
Hessequa Geyser Controls	36 Hessequa households were fitted with geyser controls in the 2013/14 financial year
Hessequa Municipality EE Lighting	1308 lights were replaced with CFLs during the 2013/14 financial year. 60 000 bulbs were already replaced with CFLs previously
Oudtshoorn SWH Programme	410 SWHs installed during 2012/13
Solar PV project	A total of 476 solar panels were installed, each capable of generating 260 Watts of power at the Eden District Municipal main building at 54 York Street, George

CENTRAL KAROO DISTRICT

Overview of Municipal Area

The Central Karoo District is one of five district municipalities in the Western Cape and covers a total area of 38 853 km^2. The district is the largest in the Western Cape in terms of land area, but with the smallest population. Invariably, this means that the distance between settlements within the district is vast. The District is comprised of three municipalities: Prince Albert, Laingsburg and Beaufort West. The District experiences high levels of poverty, unemployment and inequality.

Major activities taking place in the district include agriculture, employing 14.3% of the workforce and wholesale and retail sector, employing approximately 21.4% of the workforce and an important source of informal employment. Transport is an economic driver in the district as a result of traffic from freight (trucks) on the N1 and N12 national roads. The district is very rich in minerals such as uranium and assumed shale gas deposits. Further research into the potential resources as well as the associated environmental impacts need to be considered.

This report provides a brief energy picture for the Central Karoo District and highlights key areas or points for attention.

The Energy Picture

The Central Karoo District is only responsible for 1% of the total consumption in the Western Cape, so there will be a very small impact to the over profile when efficiency interventions are put in place. The use of liquid fuel (petrol and diesel) completely dominant the energy profile. The consumption of petrol and diesel have seen consistent decreases since 2009. There has also been a decrease in electricity consumption, the only other energy source making any impact on the energy profile.

The dominant use of energy by the transport sector is indicative of the intensive use of transport fuels as a result of the N1 and N12 national roads that run through the district. The towns in these roads are a major fuel stop for trucks passing through the region. It is difficult for the municipalities to directly influence changes in the sector as this is outside the mandate of the local and district municipalities to manage.

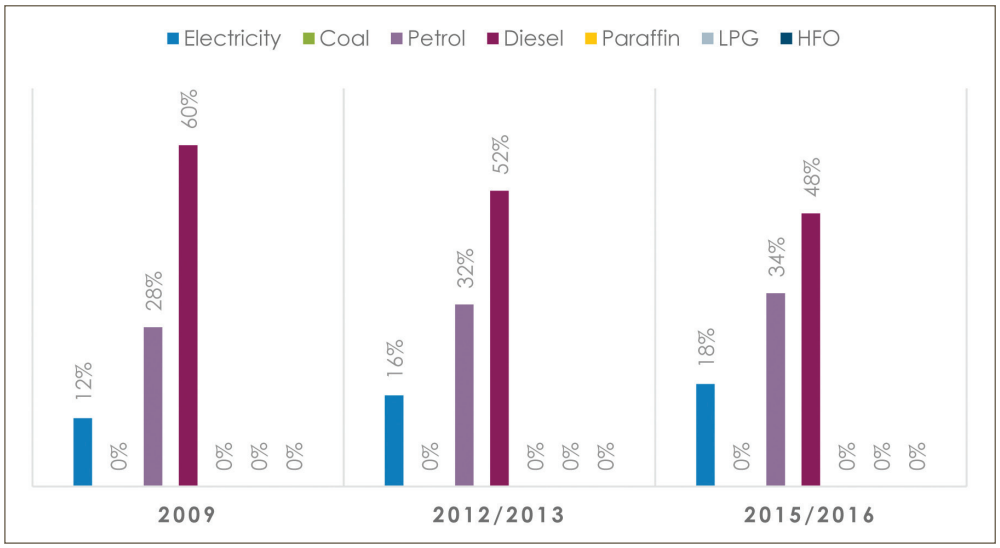

Figure 34 - Energy use by fuel for Central Karoo (GJ) – comparing 2009, 2012/13 and 2015/16

Emission from electricity dominate the emissions profile, due to South Africa's coal-fired power stations. The contribution of diesel has decreased due to the decrease in diesel consumption. The contribution of petrol consumption to the emissions profile has remained mostly the same over the three reporting periods.

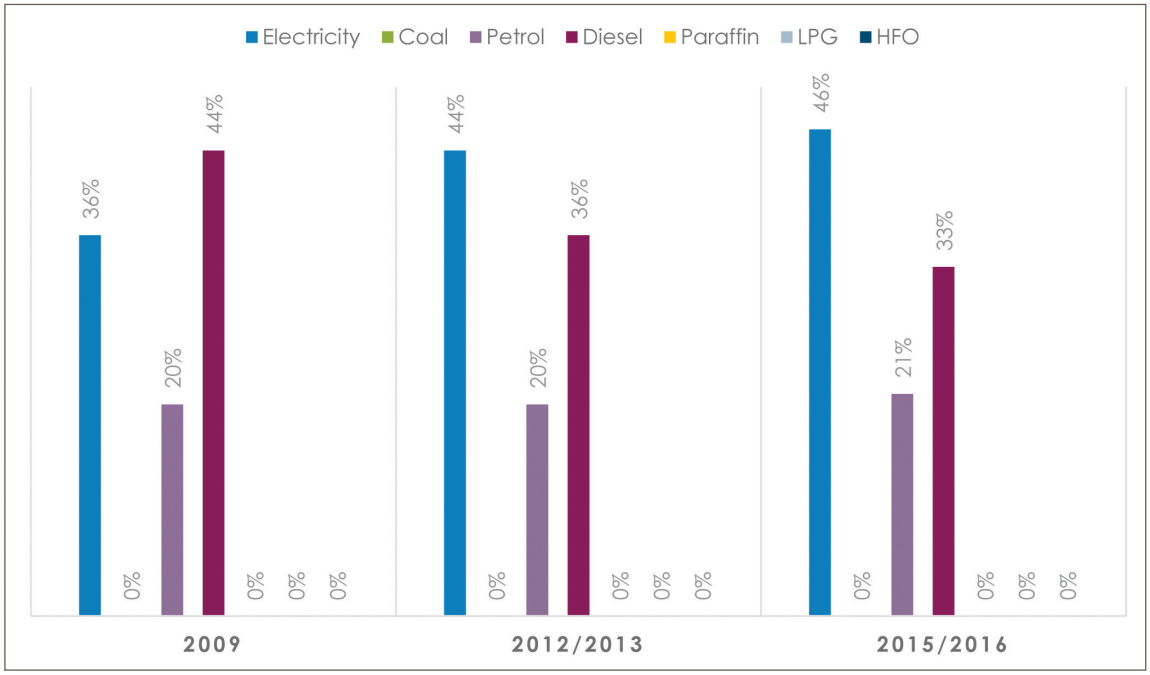

Figure 35 - Emissions by fuel type for Central Karoo (tCO_2e) – comparing 2009, 2012/13 and 2015/16

Sector Disaggregation

A large proportion of the energy consumption in the district falls within the transport sector. The large consumption of energy in the transport sector could be attributed to the use of the N1 and N12 national roads. Residential sector is the second largest energy consumer and the other sectors do not have much of an impact on the energy profile.

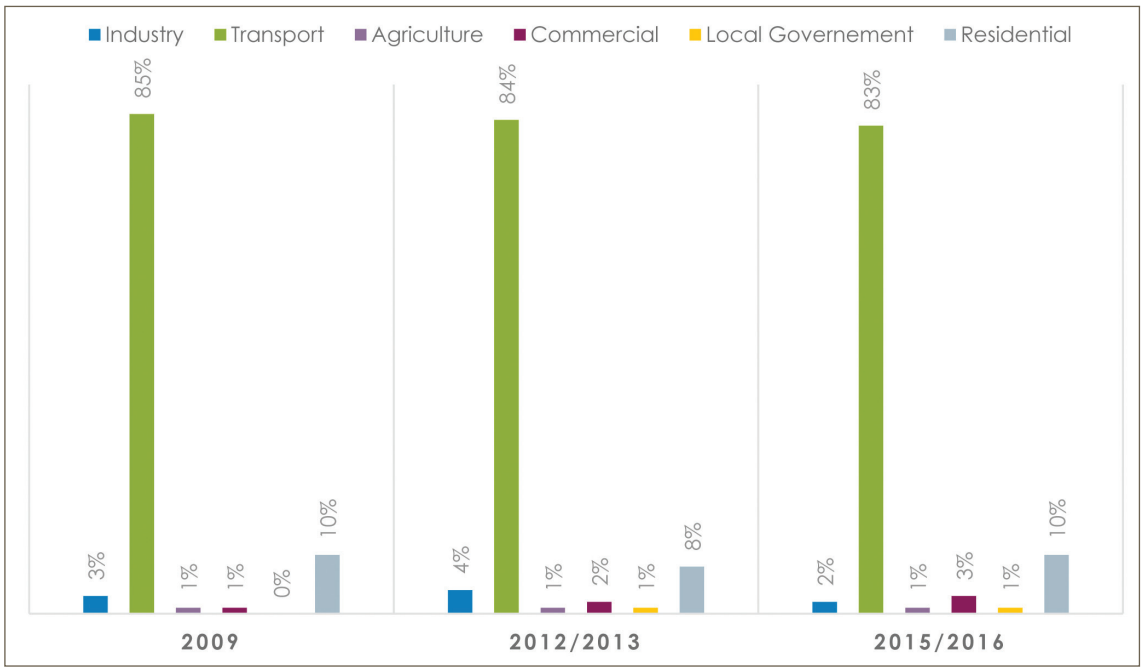

Figure 36 - Energy consumption by sector for Central Karoo (GJ) – comparing 2009, 2012/13 and 2015/16

Transport sector is the district's biggest CO_2 emitter as the transport sector is the biggest energy consumer in the district. This is followed by the residential sector and to a lesser extent commercial sector. Due to the overall dominance of the transport sector in the region, the rest of the energy profile gives a much skewed picture.

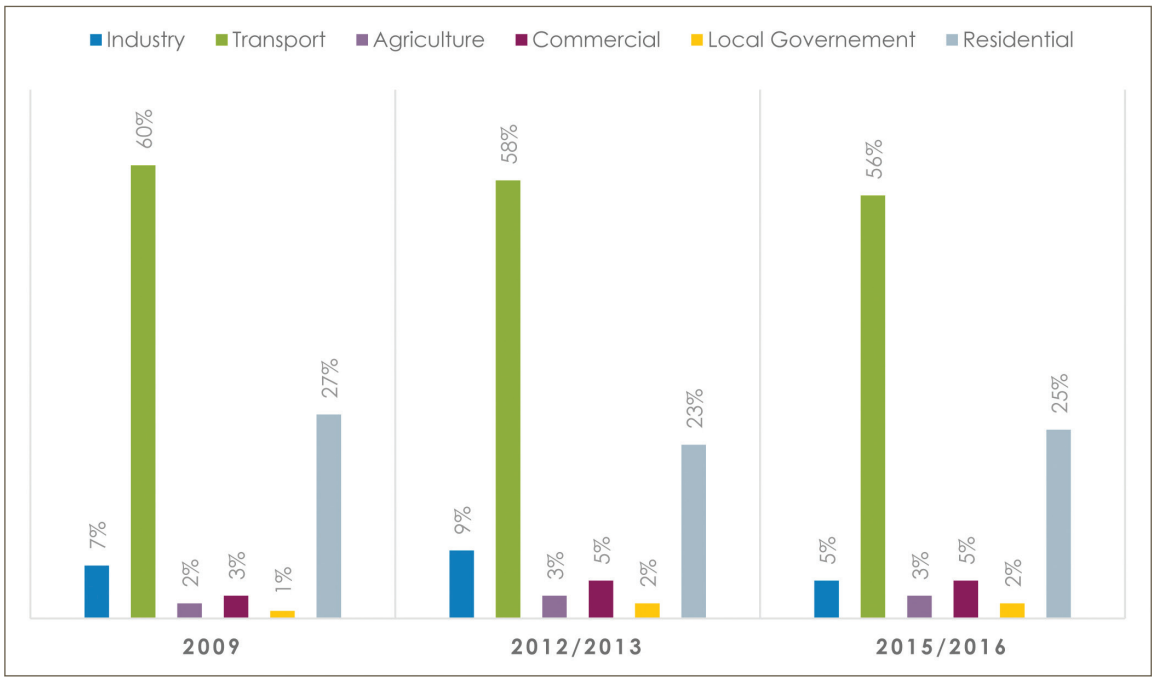

Figure 37 - Emissions by sector for Central Karoo (tCO_2e) – comparing 2009, 2012/13 and 2015/16

Understanding a sectorial contribution to district emissions enables effective management for reducing sector emissions. Sector emissions in the Central Karoo point to the high impact of the transport, residential and industrial sectors, but due to the overwhelming dominance of the transport sector in the profile, it makes it difficult for the municipality to take action here.

Given the notable contribution of electricity to emissions, it is important to understand which sectors are the larger consumers of electricity. The residential sector is the largest consumer of electricity, followed by the commercial sector and the industrial sector which has fluctuated. The low economic growth experience in the area could play a role here.

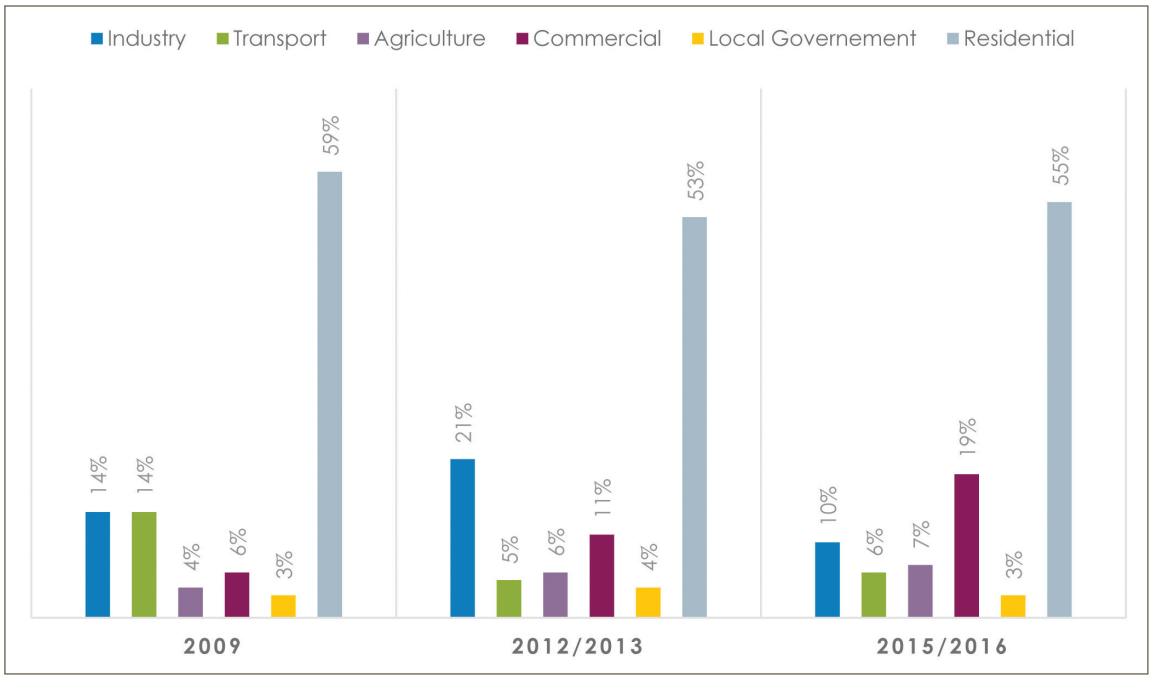

Figure 38 - Electricity consumption by sector for Central Karoo (kWh) – comparing 2009, 2012/16 and 2015/16

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