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eThekwini Greenhouse Gas Emissions Inventory 2022

Technical Report

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1 INTRODUCTION

1.1 ETHEKWINI MUNICIPALITY

The eThekwini Municipal Area (EMA) covers an area of approximately 2 580 square kilometres of which 36% is rural and a further 29% is peri-urban. The Municipality is home to approximately 4.1 million people constituting a 7% share of the total South African population, making it the third most populated municipality in the country. The economy of the EThekwini Municipal Area (EMA) is centred on the transport and logistics activities of the Port of Durban, domestic and export-oriented manufacturing, and tourism. The Gross Domestic Product (GDP) of the eThekwini Municipality during 2022 amounted to R451,5bn with a per capita income of R88,305

The EMA is governed by the eThekwini Municipality, with an Operating Budget of R57,8bn (2021/2022) and a Capital Budget of R8,1bn. During 2022 the Municipality employed 24,911 employees on a permanent and temporary basis. Basic services provided by the eThekwini Municipality are described in **Table** 1.

Table 1: Basic services provided by the eThekwini Municipality

Description	Details	Description	Details
Basic Services	Housing	Infrastructure	Stormwater
	Water		Roads
	Sanitation		Sidewalks
	Electricity & Lighting		Pedestrian bridges
	Solid Waste		Footpaths
	Transport		
	Safety & Security		
	Health		

1.2 ETHEKWINI GREENHOUSE GAS INVENTORY

In December 2010 the eThekwini Municipality became a signatory of the Global Cities Covenant on Climate ("Mexico City Pact"). In terms of this agreement the Municipality has committed to registering the Municipality's greenhouse gas (GHG) emissions inventory, commitments, climate mitigation and adaptation measures and actions in the Carbon Cities Climate Registry.

In addition to meeting the Municipality's Mexico City Pact commitments, reporting the Municipality's GHG emissions will inform policy making and forecasting emission trends, setting climate goals for future reductions and inform climate change strategies and other strategic planning processes.

The reporting of a municipal inventory also aligns eThekwini Municipality with the intentions of the National Climate Change Response White Paper (Department of Environmental Affairs, 2011) and the broader national government policy on climate change.

2 INVENTORY PARAMETERS

2.1 PROTOCOLS

The eThekwini Municipality's 2022 GHG Inventory and Inventory Report were based upon the two Local Government GHG Emissions Analysis Protocols developed by ICLEI – Local Governments for Sustainability, namely the:

- International Local Government GHG Emissions Analysis Protocol Version 1.0; and
- Local Government Operations Protocol for the Quantification and Reporting of Greenhouse Gas Emissions Inventories Version 1.1.

The protocols are designed to provide a standardized set of guidelines to assist local governments in quantifying and reporting GHG emissions associated with their government and community operations. Both protocols are based upon the Corporate GHG Protocol developed by the World Resources Institute (WRI) and the World Business Council for Sustainable Development (WBCSD) as well as technical guidance provided by the United Nations Intergovernmental Panel on Climate Change (IPCC).

The protocols were followed closely to ensure that eThekwini's 2022 GHG Inventory can be compared with other municipalities and organisations around the world utilising the same protocol.

2.2 BOUNDARIES

2.2.1 Temporal Boundary

The 2022 eThekwini GHG Inventory comprises emissions occurring during the 2022 calendar year, as required by ICLEI.

2.2.2 Operational Boundaries

The municipal inventory separately accounts for emissions associated with the operations of the eThekwini Municipality (i.e. local government emissions) and the activities that occur within the EMA, but which are not as a direct result of the Municipality's operations or assets (i.e. community emissions). These two sectors are broken down into the following analyses.

- Government Operations Analysis

The government operations analysis is defined by an organisational boundary and includes functions directly under the eThekwini Municipality's control and emissions arising from the use of all significant assets and services during 2022.

- Community Operations Analysis

The community operations analysis is defined by a geopolitical boundary and incorporates the physical area or region over which the eThekwini Municipality has jurisdictional authority. This analysis includes GHG emissions associated with activities (of the general public and industry / commerce) occurring within the eThekwini Municipality's geopolitical boundary generated during 2022.

2.3 SCOPES

The eThekwini Municipality 2022 GHG Inventory includes all important sources of GHG emissions occurring within the Municipality's geopolitical and organizational boundaries. Direct and indirect emissions are accounted for separately within each sector through the categorisation of emissions as either scope one, two or three emissions. Differentiating between emission scopes helps to avoid the possibility of double counting emissions and misrepresenting emissions when reporting.

2.3.1 Municipal Operations Emissions Scopes

Municipal operations emissions included in the inventory were categorised into the following scopes:

- **Scope** 1 – Direct emission sources owned or operated by eThekwini Municipality.
- **Scope 2** – Indirect emission sources.
- **Scope 3** – Indirect and embodied emissions over which eThekwini Municipality exerts significant control or influence. Certain emissions from contracted services were included in the municipal operations emissions inventory in instances where the service provided by the contractor is commonly provided by the municipality. These contractor emissions may be either direct or indirect but are classified as scope 3 emissions within the municipal operations inventory regardless.

Table 2 details the source of emissions included within each scope of the 2022 municipal operations emissions inventory.

Table 2: Emission sources included in the 2022 municipal operations inventory

Scope 1	Scope 2	Scope 3
Source of Emissions		
Stationary Fuel Combustion Mobile Fuel Combustion Wastewater Treatment Solid Waste Disposal Power Generation Facilities	Electricity Consumption Electricity Transmission & Distribution Losses (Technical and Non-technical losses)	Employee Air Travel Transit vehicles operated by contractor Electricity consumption by Eskom owned streetlights

2.3.2 Community-scale Emissions Scopes

Community-scale emissions included within the 2022 inventory were categorised into the following scopes:

- **Scope 1 -** All direct emission sources located within the geopolitical boundary of eThekwini Municipality.
- **Scope 2 -** Indirect emissions that result as a consequence of activity within eThekwini Municipality's geopolitical boundary
- **Scope 3 -** Indirect and embodied emissions that occur as a result of activity within the geopolitical boundary.

Table 3 provides details of the source of emissions included within each scope of the 2022 community-scale emissions inventory.

Table 3: Emission sources included in the 2022 community inventory

Scope 1	Scope 2	Scope 3
Sources of Emissions		
Stationary Fuel Combustion Mobile Fuel Combustion Solid Waste Disposal Enteric Fermentation Pre-harvest Cane Burning Industrial Processes and Product Use	Electricity Consumption	Air Transport Systems Marine Transport Systems

3 INVENTORY DETAILS

3.1 MUNICIPAL EMISSIONS

This section provides a breakdown of GHG emissions calculated within the various municipal sectors. Included in the breakdown are details pertaining to data sources and calculations used to determine emissions.

3.1.1 Buildings and Other Facilities

The 'buildings and other facilities' sector includes, emissions generated by administrative facilities, public venues, libraries, parks and recreational facilities operated by the eThekwini Municipality (**Table 4**).

Table 4: Emissions inventory and data disclosure for municipal buildings and other facilities

Scope	Emissions Source	CO_2	CH_4	N_2O	Total
		Tonnes CO_2e			
Scope 1	Stationary Combustion	515	0	2.1	517
■ Emissions Source: Stationary combustion of fuel by municipal buildings and other facilities – Activity Data: ICLEI recommended data type - Known fuel use calculated from fuel purchase data – Emissions Factor: ICLEI recommended factor - Default by fuel type (Appendix B) – Data Source: eThekwini Procurement Department					
Scope 2	Purchased Electricity				94,598
■ Emissions Source: Electricity consumption by municipal buildings and other facilities – Activity Data: ICLEI recommended data type - Known electricity use – Emissions Factor: Eskom emission factor (Appendix B) – Data Source: Treasury Department; Eskom					

3.1.2 Streetlights and Traffic Signals

This sector includes electricity consumption by streetlights and traffic signals owned by the Municipality (**Table 5**). It is also noted that Eskom provides street lighting infrastructure within the outer regions of the EMA, categorised scope 3.

Table 5: Emissions inventory and data disclosure for streetlights and traffic signals

Scope	Emissions Source	CO_2	CH_4	N_2O	Total
		Tonnes CO_2e			
Scope 2	Purchased Electricity				168,348
■ Emissions Source: Electricity consumption by municipal owned and operated streetlights and traffic signals – Activity Factor: ICLEI specified alternative activity data - Installed wattage – Emissions Factor: Eskom emission factor (Appendix B)					
Scope 3	Electricity consumed by Eskom street lighting				1,112
■ Emissions Source: Electricity consumption by Eskom owned and operated streetlights – Activity Data: ICLEI recommended activity data - Known electricity use – Emissions Factor: Eskom emission factor (Appendix B) – Data Source: Electricity Department; Eskom					

3.1.3 Water Delivery Facilities

The water delivery facilities sector includes any facilities used for the transportation, treatment, and distribution of drinking water (**Table 6**).

Table 6: Emissions inventory and data disclosure for municipal water delivery facilities

Scope	Emissions Source	CO_2	CH_4	N_2O	Total
		Tonnes CO_2e			
Scope 2	Purchased Electricity				16,674
■ Emissions Source: Electricity consumption by water pump stations and reservoirs – Activity Data: ICLEI recommended activity data - Known electricity use – Emissions Factor: ICLEI recommended factor - Eskom emission factor (Appendix B) – Data Source: Eskom					

3.1.4 Wastewater Facilities

The wastewater sector includes all facilities used for the transportation and collection or treatment of wastewater/sewage. (**Table 7**).

Table 7: Emissions inventory and data disclosure for municipal wastewater facilities

Scope	Emissions Source	CO_2	CH_4	N_2O	Total
		Tonnes CO_2e			
Scope 1	Stationary Combustion	-	45,166	-	45,166
■ Emissions Source: Incomplete combustion of digester gas at a WWTP with anaerobic digestion – Activity Data: Population served; ICLEI Equation 10.2 – Data Description: Population served by wastewater treatment plants with anaerobic digesters					
Scope 1	Process Emissions	-	6,365	20,099	26,464
■ Emissions Source: Anaerobic and facultative treatment lagoons – Activity data: Population served- ICLEI Equation 10.4 – Data Description: Population served by treatment lagoons adjusted for industrial discharge ■ Emissions Source: WWTP with nitrification/denitrification – Activity Data: Population served- ICLEI Equation 10.7 – Data Description: Population served by the WWTP with nitrification/denitrification adjusted for industrial discharge ■ Emissions Source: WWTP without nitrification/denitrification – Activity Data: Population served- ICLEI Equation 10.8 – Data Description: Population served by the WWTP without nitrification/denitrification adjusted for industrial discharge ■ Emissions Source: Effluent discharge to receiving aquatic environment – Activity Data: Population served- ICLEI Equation 10.10 – Data Description: Population served – Data Source: eThekwini Water & Sanitation					
Scope 2	Purchased Electricity				50,387

- Emissions Source: Electricity Consumption
  - Activity Data: ICLEI recommended data type - Known electricity use
  - Emissions Factor: ICLEI recommended factor type - Eskom emission factor (Appendix B)
  - Data Source: Treasury, Eskom

3.1.5 Vehicle Fleet

The vehicle fleet sector includes all emissions generated by vehicles (on-road and off-road) owned by the eThekwini Municipality (**Table 8**). These vehicles are either managed by the City Fleet Department, Water Department, Solid Waste Department or Electricity Department.

Table 8: Emissions inventory and data disclosure for municipal vehicle fleet

Scope	Emissions Source	CO_2	CH_4	N_2O	Total
		Tonnes CO_2e			
Scope 1	Mobile Combustion	60,593	46.00	635.23	61,275

- Emissions Source: Fuel combustion by on-road and off-road vehicles
  - Activity Data: ICLEI recommended activity data - Fuel purchases
  - Emissions Factor: ICLEI recommended factor - Default by fuel type (Defra 2011; Appendix B)
  - Data Source: City Fleet, EWS, DSW

3.1.6 Transit Fleet

The transit sector should include emissions from mass transit vehicles operated by the Municipality to service the community of the EMA. However, as the Municipality's transit fleet has been outsourced to a private contractor the emissions generated are classified as scope three instead of scope one emissions (**Table 9**).

Table 9: Emissions inventory and data disclosure for municipal transit fleet

Scope	Emissions Source	CO_2	CH_4	N_2O	Total
		Tonnes CO_2e			
Scope 3	Mobile Combustion	26,889	15	297	27,202

- Emissions Source: Fuel combustion by on-road and off-road transit fleet
  - Activity Data: ICLEI recommended activity data - Fuel purchases
  - Emissions Factor: ICLEI recommended factor - Default by fuel type (Defra 2011; Appendix B)
  - Data Source: Tansnat

3.1.7 Power Generation Facilities

The Municipality does not own or operate any fossil fuel power generation facilities any fossil fuel power generation facilities, however it owns a large proportion of electricity distribution infrastructure within the EMA. Transmission and distribution losses resulting from the transmission of electricity via the municipal owned infrastructure are therefore categorised as scope 2 **(Table 10).**

Table 10: Emissions inventory and data disclosure for municipal power generation and electrical distribution facilities

Scope	Emissions Source	CO_2	CH_4	N_2O	Total
		Tonnes CO_2e			
Scope 1	Power Generation facilities: Fugitive Emissions				-
■ Emissions Source: Sulphur Hexaflouride (SF6) – Activity Data: SF6 consumption data – Emissions Factor: ICLEI recommended factor type (Appendix B)					
Scope 2	Transmission & Distribution Losses: Technical				307,209
■ Emissions Source: Technical transmission and distribution losses – Activity Data: eThekwini Electricity Department calculations – Emissions Factor: ICLEI recommended factor type - Eskom emission factor (Appendix B)					
Scope 2	Transmission & Distribution Losses: Non-Technical				801,268
■ Emissions Source: Non-technical transmission and distribution losses – Activity Data: eThekwini Electricity Department calculations – Emissions Factor: ICLEI recommended factor type - Eskom emission factor (Appendix B) – Data Source: eThekwini Electricity Department					

3.1.8 Solid Waste Facilities

eThekwini Municipality owns four solid waste landfills.

Fugitive methane emissions generated by these landfills are classified as scope one municipal emissions (**Table 11**).

Table 11: Emissions inventory and data disclosure for municipal solid waste facilities

Scope	Emissions Source	CO_2	CH_4	N_2O	Total
		Tonnes CO_2e			
Scope 1	Fugitive Emissions	-	116,015	-	116,015
■ Emissions Source: Landfills with comprehensive LFG collection systems – Activity Data: ICLEI recommended data type - ICLEI Equation 9.1 ■ Emissions Source: Landfills with no LFG collection systems – Activity Data: ICLEI recommended model and data type – First Order Decay Model – Data Source: eThekwini Cleansing and Solid Waste Department					
Scope 2	Purchased Electricity				186
■ Emissions Source: Electricity consumption – Activity Data: ICLEI recommended data type - Known electricity use – Emissions Factor: ICLEI recommended factor type - Eskom emission factor (Appendix B) – Data Source: Treasury Department					

3.1.9 Air Travel

Greenhouse gas emissions generated from work-related air travel, by municipal employees, are categorised as scope three municipal emissions **(Table 12).**

Table 12: Emissions inventory and data disclosure for municipal air travel

Scope	Emissions Source	CO_2	CH_4	N_2O	Total
		Tonnes CO_2e			
Scope 3		245	0	2	248
■ Emissions Source: Fuel combustion by air transport systems – Activity Data: GHG Protocol recommended data type – number of flights and destination data – Emissions Factor: DEFRA 2011 emissions factor – emission factor based on length of flight (Appendix B) – Data Source: Rennies Travel					

3.2 COMMUNITY EMISSIONS

3.2.1 Residential Sector

This emissions sector includes all emissions generated by the EMA's residential sector through electricity consumption as well as stationary fuel combustion (**Table 13**).

Table 13: Emissions inventory and data disclosure for community residential sector

Scope	Emissions Source	CO_2	CH_4	N_2O	Total
		Tonnes CO_2e			
Scope 1	Stationary Combustion	495,467	1,058	1351	497,876
■ Emissions Source: Stationary combustion fuel – Activity Data: ICLEI recommended activity data - Known fuel use – Emissions Factor: ICLEI recommended factor - Default by fuel type (Defra 2011, Appendix B) – Data source: National Department of Energy					
Scope 2	Purchased Electricity				2,560,996
■ Emissions Source: Electricity consumption – Activity Data: ICLEI recommended data type - Known electricity use – Emissions Factor: ICLEI recommended factor type - Eskom emission factor (Appendix B) – Data Source: eThekwini Electricity Department					

3.2.2 Commercial Sector

This emissions sector includes all emissions generated by the EMA's commercial sector through electricity consumption only (**Table 14**).

Table 14: Emissions inventory and data disclosure for community commercial sector

Scope	Emissions Source	CO_2	CH_4	N_2O	Total
		Tonnes CO_2e			
Scope 2	Purchased Electricity				2,216,894

- Emissions Source: Electricity consumption
  - Activity Data: ICLEI recommended data type - Known electricity use
  - Emissions Factor: ICLEI recommended factor type - Eskom emission factor (Appendix B)
  - Data Source: eThekwini Electricity Department; ESKOM

3.2.3 Industrial Sector

This emissions sector includes all emissions generated by the EMA's industrial sector through electricity consumption as well as stationary fuel combustion (**Table 15**).

Table 15: Emissions inventory and data disclosure for community industrial sector

Scope	Emissions Source	CO_2	CH_4	N_2O	Total
		Tonnes CO_2e			
Scope 1	Stationary Combustion				4,760,279
■ Emissions Source: Stationary combustion fuel – Activity Data: ICLEI recommended activity data - Known fuel use – Emissions Factor: ICLEI recommended factor - Default by fuel type (Defra 2011, Appendix B) – Data Source: National Department of Energy					
Scope 2	Purchased Electricity				4,132,571
■ Emissions Source: Electricity consumption – Activity Data: ICLEI recommended data type - Known electricity use – Emissions Factor: ICLEI recommended factor type - Eskom emission factor (Appendix B) – Data Source: eThekwini Electricity Department					

3.2.4 Transport

The community transport sector includes emissions generated by community owned on-road and off-road vehicles as well as by the community's air and marine transport systems (**Table 16**). Air and marine transport systems are classified as scope 3 emissions.

Table 16: Emissions inventory and data disclosure for community transport sector

Scope	Emissions Source	CO_2	CH_4	N_2O	Total
		Tonnes CO_2e			
Scope 1	Mobile Combustion	8,288,302	8,967	78,888	8,376,157
■ Emissions Source: On-road and off-road vehicles					
Scope 3	Mobile Combustion – Air Travel	170,500	156	1,677	172,341
■ Emissions Source: Air transport systems fuel combustion					
Scope 3	Mobile Combustion – Water Travel	4 004 012	4 342	419 403	4 427 756
■ Emissions Source: Water transport systems fuel combustion – Activity Data: ICLEI recommended activity data - Known fuel use – Emissions Factor: ICLEI recommended factor - Default by fuel type (Appendix B)					

3.2.5 Agriculture

Emissions sources covered within the agriculture sector included enteric fermentation by livestock and pre-harvest sugarcane burning (**Table 17**). Both these emission sources are classified as community scope one emissions.

Table 17: Emissions inventory and data disclosure for community agricultural sector

Scope	Emissions Source	CO_2	CH_4	N_2O	Total
		Tonnes CO_2e			
Scope 1	Enteric Fermentation		16 558		16 558
■ Emissions Source: Enteric fermentation by livestock – Activity Data: IPCC 2006 recommended data – livestock type and numbers – Emissions Factor: IPCC 2006 emissions factor - Default by animal type (Appendix B) – Data Source: National Department of Agriculture, Forestry and Fisheries.					
Scope 1	Residue Burning		51 573	19 738	71 310
■ Emissions Source: Infield pre-harvest sugarcane burning – Activity Data: IPCC 2006 Equation 2.27 Estimation of GHG Emissions – Emissions Factor: IPCC 2006 factors – Data Source: Environmental Planning &Climate Protection Department					

3.2.6 Solid Waste

The community solid waste sector includes emissions generated by privately owned landfills situated within the Municipality's geopolitical boundary (**Table 18**).

Table 18: Emissions inventory and data disclosure for community solid waste sector

Scope	Emissions Source	CO_2	CH_4	N_2O	Total
		Tonnes CO_2e			
Scope 1	Fugitive Emissions		145,270		145,270
■ Emissions Source: Fugitive emissions generated by two privately owned landfills – Activity Data: ICLEI recommended model and data type – First Order Decay Model					

4 EMISSIONS ANALYSIS

Within both the Municipal Operations Analysis and the Community Operations Analysis the principal contributor to GHG emissions are scope 2 indirect emissions from electricity consumption, although community scope 1 emissions are almost as large as the community scope 2 (**Table 19**).

Table 19: GHG emissions inventory results

EMISSIONS SCOPE	MUNICIPAL EMISSIONS (tCO_2e)	COMMUNITY EMISSIONS (tCO_2e)
Scope 1	252,021 (14.7%)	14,299,888 (51.3%)
Scope 2	1,438,670 (83.7%)	8,905,732 (31.9%)
Selected Scope 3	28,561 (1.6%)	4,695,795 (16.8%)

4.1 MUNICIPAL EMISSIONS

The principal municipal emission source, contributing 64% to the Municipality's total 2022 GHG emission inventory, was electrical transmission and distribution losses (Power Generation Facilities) (scope 2).

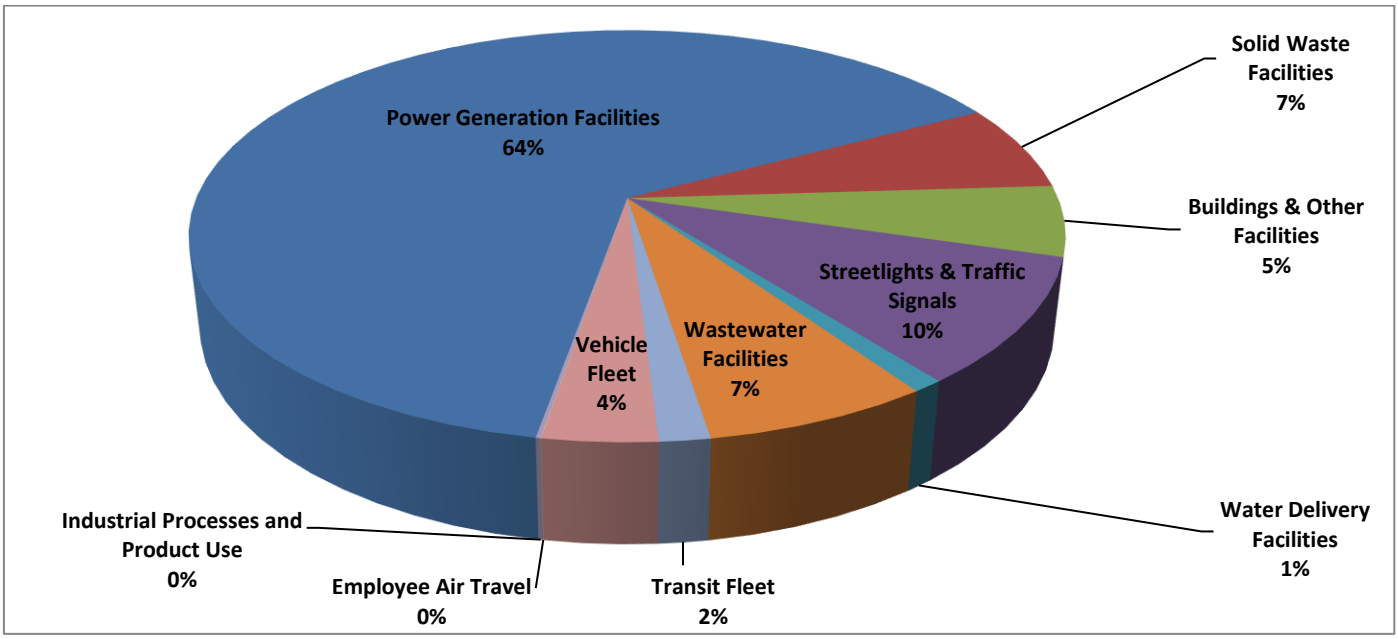

Figure 1: Municipal Sector Emissions

Table 20: Municipal sector emissions

Municipal Sector	Emissions Scope	Emissions (tCO_2e)
Buildings and Other Facilities	Scope 1	517
	Scope 2	94,598
Additional Scope 3 Emissions	Scope 3	248
Power Generation Facilities	Scope 2	1,108,477
Sanitation and Solid Waste Facilities	Scope 1	116,015
	Scope 2	186
Streetlights and Traffic Signals	Scope 2	168,348
	Scope 3	1,112
Vehicle Fleet	Scope 1	61,275
	Scope 3	27,202
Wastewater Facilities	Scope 1	71,631
	Scope 2	50,387
Water Delivery Facilities	Scope 2	16,674
Industrial Process and Product Use	Scope 1	2,582

4.1.1 Municipal GHG Emissions Intensity Figures

Emissions intensity figures calculated for the Municipality are provided in **Table 21**. These figures were calculated by combining all municipal scope 1 and 2 emissions and dividing them by the relevant indicator.

Table 21: Municipal GHG intensity figures

Intensity Figure	Unit	Metric Numerator	Unit	Metric Denominator	Unit
R 29.25	tCO_2e / million Rand of operating budget	1,690,691	tCO2e (Municipal Scope 1 & 2)	R 57,000.00	Million Rand Operating Budget (2021/ 2022)
R 208.73	tCO_2e / million Rand of Capital budget	1,690,691	tCO2e (Municipal Scope 1 & 2)	R 8,100.00	Million Rand Capital Budget (2021/ 2022)
67.87	tCO_2e / Permanent employee	1,690,691	tCO2e (Municipal Scope 1 & 2)	24,911	Permanent Employees

4.2 COMMUNITY EMISSIONS

4.2.1 Community Emissions Analysis

The principal community sector emission source within the EMA during 2022 was the industrial sector, contributing 34% to total community emissions (**Figure 2**, Table 22). The second major contributor was the on-road and off-road (ground) transport sector contributing 30% to overall community emissions.

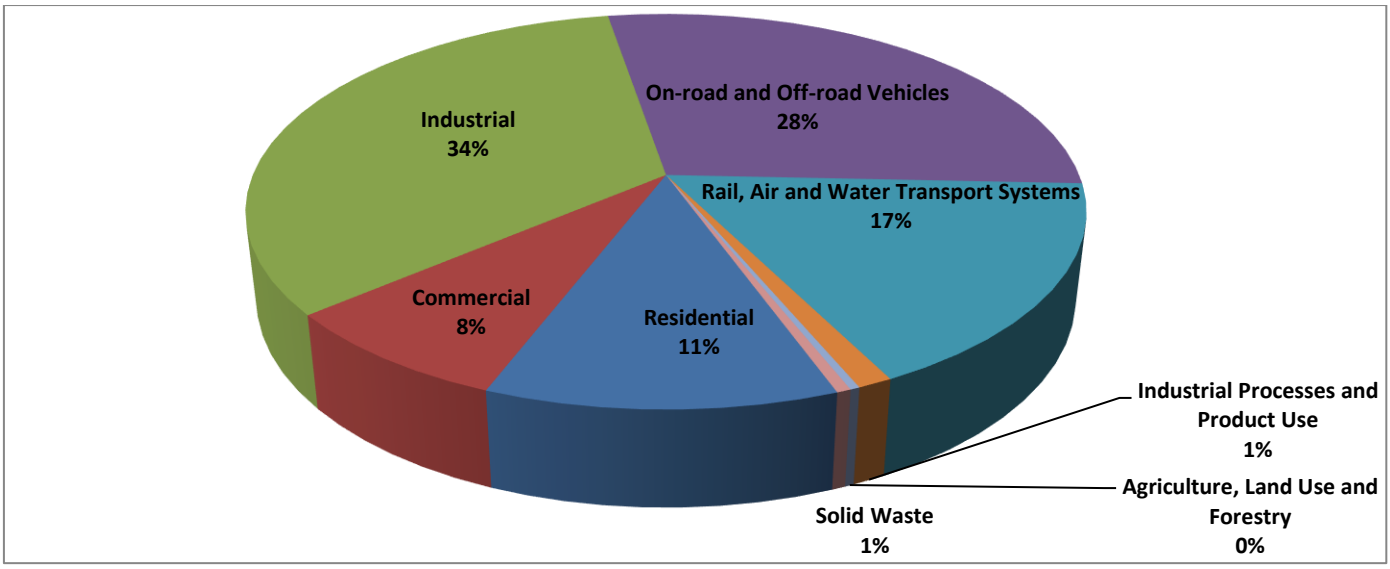

Figure 2: Community Sector Emissions

Table 22: Community sector emissions

Community Sector	Emissions Scope	Emissions (tCO_2e)
Residential	Scope 1	630,555
	Scope 2	2,556,034
Commercial	Scope 2	2,216,962
Industrial	Scope 1	5,221,843
	Scope 2	4,132,737
On-road and Off-road Vehicles	Scope 1	7,909,465
Rail, Air and Water Transport Systems	Scope 3	4,695,795
Solid Waste	Scope 1	130,733
Industrial process & Product Use	Scope 1	319,424
Agriculture, Land Use and Forestry	Scope 1	87,868

4.2.2 Community Emissions Intensity Figures

Emissions intensity figures calculated for the EMA for 2022 are provided in **Table 23**. These emissions were calculated by combining relevant sector scope one and two emissions and dividing them by the relevant indicators.

Table 23: Community GHG intensity figures

Intensity Figure	Unit	Metric Numerator	Unit	Metric Denominator	Unit
2.57	tCO2e / household	3,186,589	tCO2e (Residential Scope 1 & 2)	1,240,807	Number of households within the EMA
R21.95	tCO_2e / million Rand of Capital budget	2,216,962	tCO2e (Commercial Scope 1 & 2)	R 101,000.00	2022 Annual retail trade sales

4.2.3 Total Emissions Intensity Figures

Total emission intensity figures (for the municipality and the community) are recorded in the table below. These emissions were calculated by combining relevant sector scope emissions and dividing them by the relevant indicators. A per capita figure has been calculated using total scope 1 and 2 emissions, and separately using emissions from all three scopes to account for different methodologies of calculating this figure.

Table 24: Total Emissions Intensity Figures

Intensity Figure	Unit	Metric Numerator	Unit	Metric Denominator	Unit
5.95	tCO2e / Capita	24,896,311	tCO2e (Scope 1 & 2)	4,184,944	Population within the EMA
6.97	tCO2e / Capita	29,175,112	tCO2e (Scope 1, 2 & 3)	4,184,944	Population within the EMA

5 COMPARISON AGAINST PREVIOUS INVENTORIES

The 2010 eThekwini GHG Inventory serves as the baseline inventory because the methodology for collecting, and reporting data was clearly defined for this period. This emerging emissions trend is summarised in the table and graph below. As is evident from these data sets, there is a continued and steady increase in greenhouse gas emissions over time in the city. This trend is primarily because of improved data collection methodologies but also due to increased uses of energy and carbon intensive processes in the city.

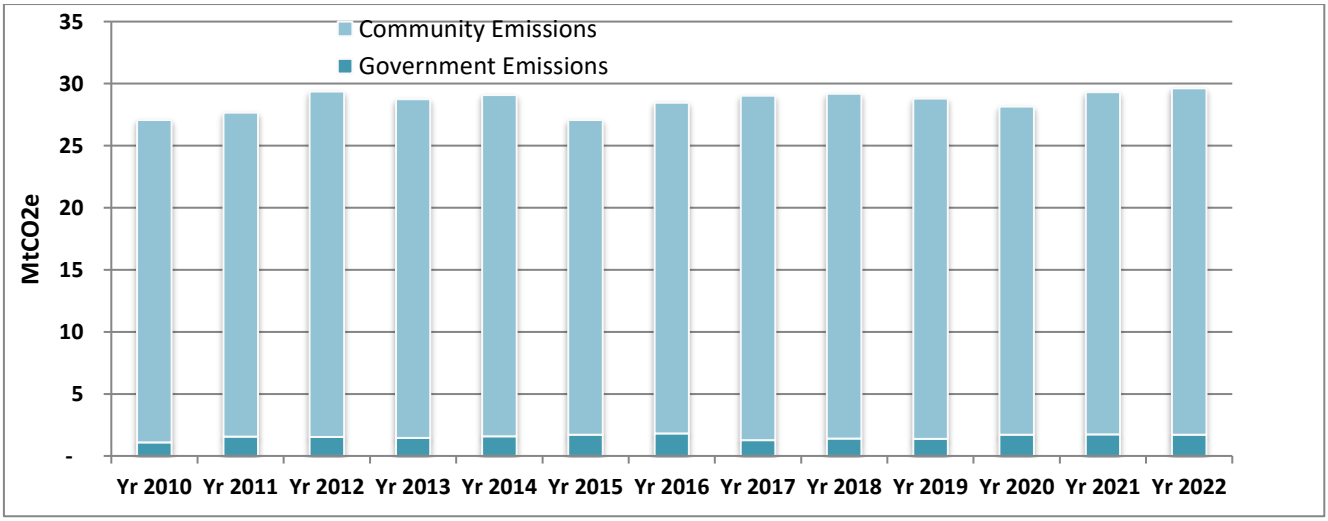

Figure 3: Comparison of Emissions 2010 through to 2022

Table 25: Percentage change of Emissions from baseline

Year	Government Emissions	Community Emissions	Total Emissions	% Change
Yr 2010	1,104,212	25,962,074	27,066,285	
Yr 2011	1,551,420	26,097,979	27,649,400	2.2%
Yr 2012	1,526,431	27,833,965	29,360,395	6.2%
Yr 2013	1,450,928	27,290,630	28,741,558	-2.1%
Yr 2014	1,586,674	27,505,329	29,092,003	1.2%
Yr 2015	1,715,259	25,352,653	27,067,912	-7.0%
Yr 2016	1,817,486	26,647,189	28,464,675	5.2%
Yr 2017	1,261,219	27,764,419	29,025,638	2.0%
Yr 2018	1,715,465	26,426,352	28,141,817	-3.0%
Yr 2019	1,363,657	27,440,798	28,804,454	2.4%
Yr 2020	1,715,465	26,426,352	28,141,817	-2.3%
Yr 2021	1,740,189	27,564,465	29,304,653	4.1%
Yr 2022	1,719,252	27,901,415	29,620,667	1.1%

Table 25 provides comparison of the difference in emissions (Government emissions and Community emissions) between the years 2010 to 2022.

The total emissions for 2022 were estimated to be 29 620 667 tCO_2e; 27 901 415 tCO_2e (94%) from the Community sector, while 1 719 252 tCO_2e (6%) are produced from the Municipal sector.

Total emissions had increased by 1.1% in 2022, which is equivalent to 316 013 tCO_2e emitted. The municipal emissions have decreased by 20 936.7 tCO_2e between 2021 and 2022, whilst community emissions have increased between 2021 and 2022 from 27 564 464.9 tCO_2e to 27 901 415.4 tCO_2e.

Table 26: Comparison of Emissions 2021 against 2022

Scope	Type	Sub-Type	2021 (tCO_2e)	2022 (tCO_2e)
Municipal Scope 1	Fuel Consumption	Stationary Fuel Combustion	517.3	517.3
		Vehicle Fleet	61,277.9	61,275.1
	Solid Waste	Solid Waste (CH4)	34,875.0	116,015.5
	IPPU	Bitumen	2,582.4	2,582.4
	Wastewater Treatment	Wastewater (CH4)	71,007.5	1,630.6
Municipal Scope 2	Electricity Consumption	Buildings	81,209.5	94,597.8
		Streetlights & Traffic Signals	168,426.3	168,347.8
		Water Delivery Facilities	14,013.9	16,674.0
		Transmission and Distribution Losses	1,227,835.8	1,108,477.4
		Solid Waste Facilities	180.5	185.7
		Wastewater Facilities	48,398.4	50,387.0
Municipal Scope 3	Transport Systems	Streetlights	1,109.1	1,111.9
		Transit Fleet	28,723.1	27,201.7
		Flights	32.0	247.7
Subtotal Municipal			**1,740,188.6**	**1,719,251.9**
Community Scope 1	Fuel Consumption	Stationary Fuel Combustion	5,258,155.1	5,852,398.2
		Mobile Fuel Combustion	8,376,157.1	7,909,464.7
	Solid Waste	Solid Waste	145,270.0	130,733.0
	Industrial Processes & Product Use	Industrial Process	142,126.0	275,094.0
	Industrial Processes & Product Use	SF_6	44,330.0	44,330.0
	Agric & Land use	Agric & Land use	87,868.4	87,868.4
Community Scope 2	Electricity Consumption	Residential	2,560,995.9	2,556,034.0
		Commercial	2,216,894.2	2,216,961.6
		Industrial	4,132,570.9	4,132,736.7
Community Scope 3	Transport Systems	Air Transport Systems	172,341.0	268,038.5
		Water Transport Systems	4,427,756.4	4,427,756.4
Subtotal Community			**27,564,464.9**	**27,901,415.5**
Total			**29,304,653.5**	**29,620,667.3**

6 CONCLUSIONS

Total emissions for 2022 were estimated to be 29,620,667.3 tCO_2e. The 2022 emissions have increased by 316,013.8 tCO_2e compared to 2021 emissions. The community sector accounts for 94% of all the emissions and the municipality sector accounts for 6%. The municipal sector emissions have decreased by 20,936.7 tCO_2e whilst community sector have increased by 336,950.5 tCO_2e as compared to the 2021 emission results. The decrease in Transmission and Distribution Losses have contributed to the observed decrease in government emissions. Meanwhile the increase in Fuel Consumption, Industrial Process and Air Transport Systems informed the increase in community emissions.

Transportation and industrial sectors have been identified as the largest emitters, sitting at 42% and 32% respectively. This trend was observed with previous GHG emissions inventory.

Electrical transmission and distribution losses are the biggest emitter in the municipal sector. In the community sector, transport (emissions from on-road and off-road vehicles; and rail, air, and water transport system) is the highest emitter at 45% combined followed by industrial emissions at 34%.