

# COPI7 fact sheet

## Air quality and climate change

Air quality issues often become confused with climate change issues, because both have to do with gaseous emissions into the atmosphere.

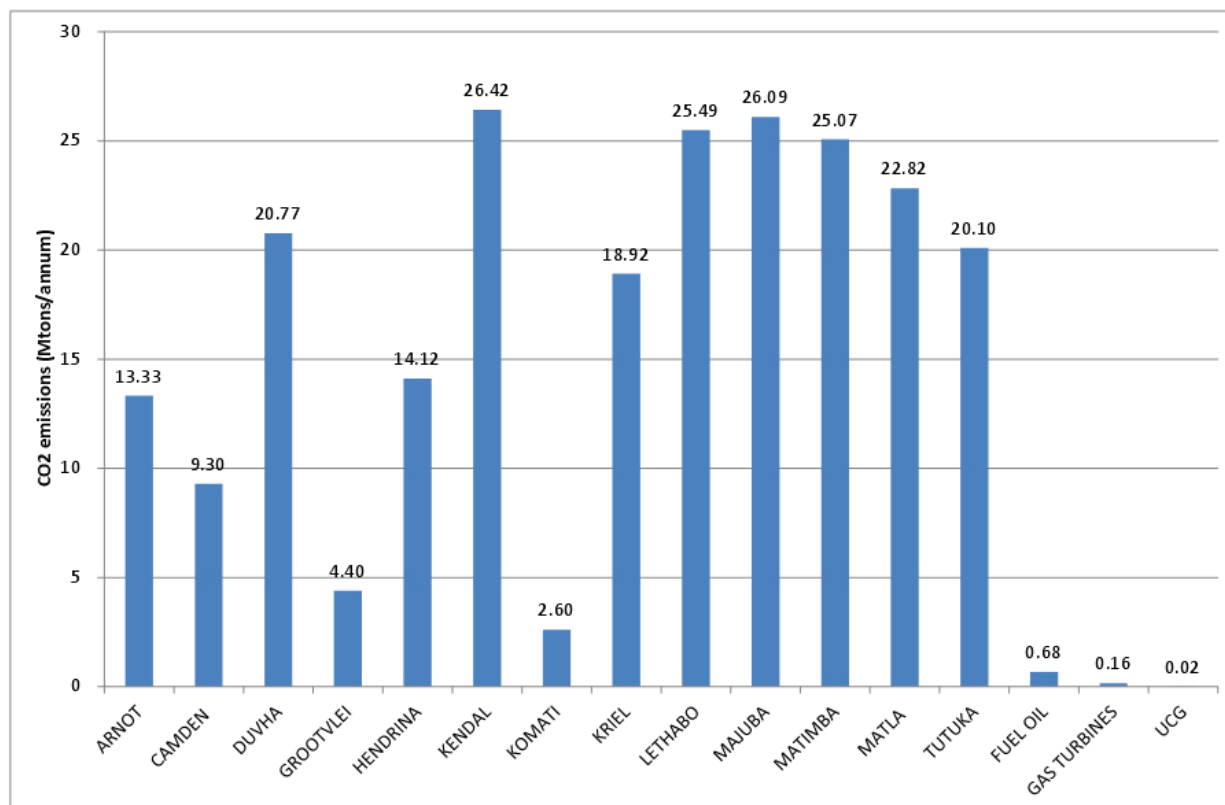
However, the following distinctions should be made:

- Climate change or global warming is caused by the emission of *greenhouse gases*, which alter the *radiative properties* of the atmosphere. Greenhouse gases increase the absorption of longwave terrestrial radiation by the atmosphere, resulting in an overall warming of the atmosphere.
- *Air pollutants* are substances which are toxic when present in elevated concentrations, and may have a detrimental effect on human health or the natural environment (soils, vegetation, water bodies).
- The global warming impact of greenhouse gases is global. Air quality impacts are local and regional.
- Examples of greenhouse gases are carbon dioxide (CO<sub>2</sub>), methane (CH<sub>4</sub>), nitrous oxide (N<sub>2</sub>O), CFCs, HFCs. Examples of air pollutants are sulphur dioxide (SO<sub>2</sub>), oxides of nitrogen (NO and NO<sub>2</sub>) and particulates (smoke, dust, ash etc).
- Ozone (a gas which is not emitted directly, but forms in the atmosphere from other substances like carbon monoxide, volatile organic compounds and oxides of nitrogen in the presence of sunlight) and black carbon (a particulate which forms from incomplete combustion) both warm the atmosphere and are air pollutants. Some particulates, like sulphates, have a cooling effect on climate, so there is an interaction between air quality and climate change.



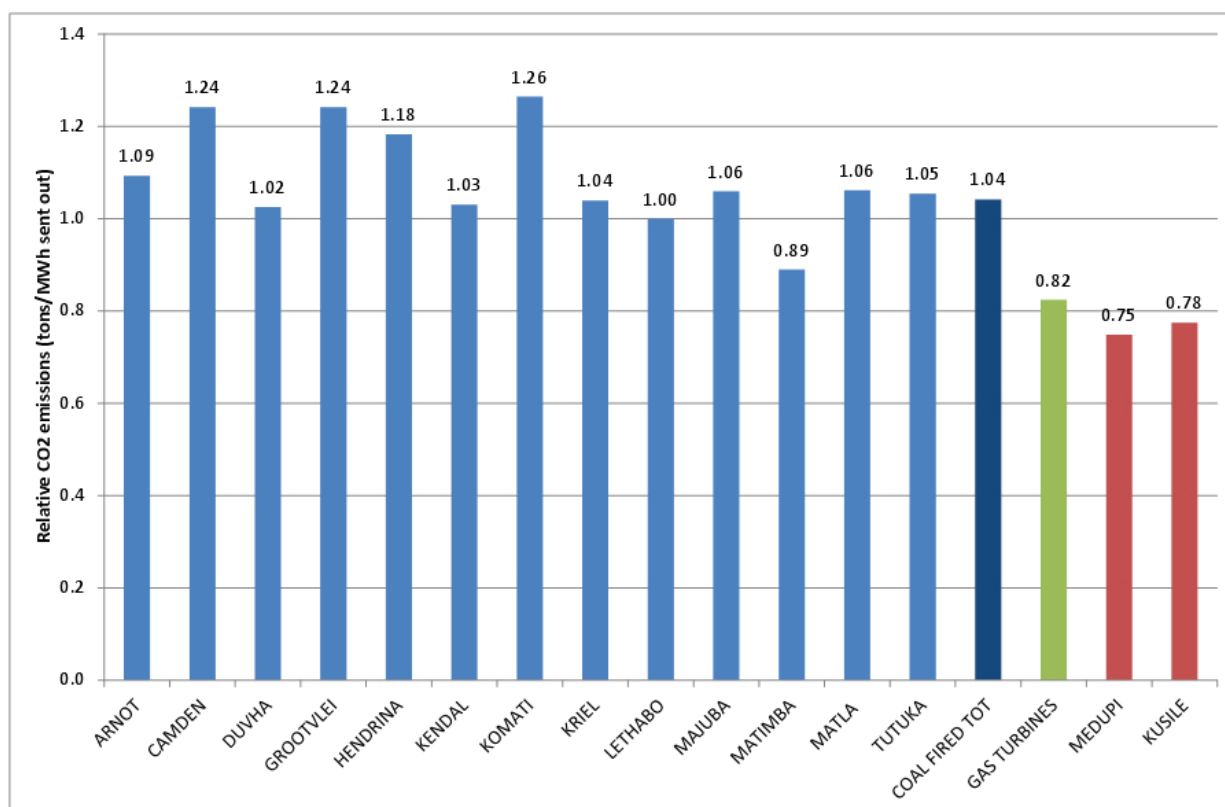
## What are Eskom's CO<sub>2</sub> emissions?

In the 2010/11 Financial Year, Eskom emitted 230,3 million tons of CO<sub>2</sub> from power generation. CO<sub>2</sub> emissions from Eskom's power stations in the last financial year are (in millions of tons):



As one would expect, it is the largest stations that emit the most CO<sub>2</sub> (Kendal, Majuba, Lethabo and Matimba).

A better reflection of the efficiency of power stations is relative CO<sub>2</sub> emissions, ie the tons of CO<sub>2</sub> produced per MWh sent out:



Generally, the CO<sub>2</sub> emissions are related to the age of the power station. The older return-to-service power stations (Camden, Grootvlei and Komati) have the lowest efficiencies and the highest relative emissions – over 1,2 tons CO<sub>2</sub> per MWh sent out. Matimba has the lowest relative emissions of 0,89 tons CO<sub>2</sub> per MWh sent out. The average for the existing Eskom fleet in the last financial year was 1,04 tons CO<sub>2</sub> per MWh sent out.

The gas turbine stations, which run on liquid fuels (diesel and kerosene) have higher efficiencies and lower relative CO<sub>2</sub> emissions than Eskom's existing fleet, averaging 0,82 tons CO<sub>2</sub> per MWh sent out.

Eskom's existing coal-fired fleet is based on sub-critical technology. Medupi and Kusile Power Stations are being constructed with more efficient super-critical technology. As a result, their relative CO<sub>2</sub> emissions will be lower – 0,78 tons per MWh sent out for Kusile, and 0,75 tons per MWh sent out for Medupi.

## Air quality management at Eskom

Each power station has an emission licence (called an APPA Registration Certificate), which has limits for the concentrations of particulates (ash), sulphur dioxide and oxides of nitrogen that may be emitted.

Most of the ash produced at power stations is not emitted from the stacks, but is captured and deposited on ashing facilities. Emissions of ash from Eskom's power stations are greatly reduced



by electrostatic precipitators, usually aided by flue gas conditioning plants, or fabric filter plants. These technologies have an efficiency of at least 99%, and over 99,9% in many cases. Ash emissions from stations with electrostatic precipitators are less than 300 mg/Nm<sup>3</sup> and less than 75 mg/Nm<sup>3</sup> in some cases, and ash emissions from stations with fabric filter plants are less than 50 mg/Nm<sup>3</sup>.

The abatement technologies installed at each power station are:

Power station	Abatement technology
Arnot	Fabric filter plants
Camden	Fabric filter plants
Duvha Units 1-3 Duvha Units 4-6	Fabric filter plants Electrostatic precipitators and flue gas conditioning
Grootvlei Units 1, 5, 6 Grootvlei Units 2, 3, 4	Fabric filter plants Electrostatic precipitators and flue gas conditioning
Hendrina	Fabric filter plants
Kendal	Electrostatic precipitators and flue gas conditioning
Komati	Electrostatic precipitators and flue gas conditioning
Kriel	Electrostatic precipitators and flue gas conditioning
Lethabo	Electrostatic precipitators and flue gas conditioning
Majuba	Fabric filter plants
Matimba	Electrostatic precipitators and flue gas conditioning
Matla	Electrostatic precipitators and flue gas conditioning
Tutuka	Electrostatic precipitators
Medupi	Fabric filter plant, low NO <sub>x</sub> burners, flue gas desulphurisation (FGD to be installed 6 years after units are commissioned)
Kusile	Fabric filter plant, low NO <sub>x</sub> burners, flue gas desulphurisation

## Compliance with new legislation

Minimum Emission Standards were published in terms of the National Environmental Management: Air Quality Act in 2010, requiring Eskom to install many retrofits of abatement technologies in order to comply with the standards. The retrofits will require extensive outage time, and the cost will be many billions of Rand.

The climate change consequences of reducing emissions of air pollutants are complex. For example:

- Reducing sulphur dioxide emissions (through the installation of flue gas desulphurisation, for example), will reduce the concentration of sulphate aerosol particulates in the atmosphere, which in turn could result in a local warming,

since sulphate aerosols are reflective and have a cooling effect on climate

- Installing flue gas desulphurisation to reduce sulphur dioxide emissions will increase relative CO<sub>2</sub> emissions from the power station since the efficiency will drop, and will result in additional CO<sub>2</sub> emissions directly from the FGD process (which converts sulphur dioxide (SO<sub>2</sub>) and calcium carbonate (CaCO<sub>3</sub>; limestone) to gypsum (CaSO<sub>4</sub>) and CO<sub>2</sub>).
- An improvement in the efficiency of a power station, or a switch to a lower emitting technology like nuclear or renewables, would lower emissions of both greenhouse gases and air pollutants.

## Emission monitoring and reporting

Emissions of ash are continuously monitored from all units/stacks, and gaseous emissions (sulphur dioxide, nitrogen oxides and carbon dioxide) are monitored on one unit/stack at each power station. Total gaseous emissions from the power stations are calculated on a monthly basis. Emissions from power stations are reported to the Emission Licencing Authorities (Provincial Government or District Municipalities) each month.

## Ambient air quality monitoring

As well as monitoring emissions from stacks, Eskom has a network of 16 ambient air quality monitoring stations around the country, usually in the vicinity of power stations. These monitoring stations measure the levels of pollutants which people breathe, and to which ecosystems are subjected.

## Matimba's award

Matimba Power Station was presented with the 2011 National Association of Clean Air (NACA) Award for 'consistent reduction of point source particulate emissions' in October 2011.



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