World Conference on
Climate Change and Global Warming

21 - 23 November 2025 Copenhagen, Denmark

South African Industries and Carbon Dioxide Emissions: An Analysis of Key Sectors and Mitigation Strategies

Makhanana Nkhwashu , Mapula Lucey Mavhungu, Agboola Oluranti

Tshwane University Of Technology, Pretoria, South Africa/covenant University, Ota State, Nigeria

Abstract

South Africa, a leading economic hub in Africa, significantly contributes to carbon dioxide (CO?) emissions due to its reliance on carbon-intensive industries. This article examines the primary sectors—energy, mining, manufacturing, and transportation—driving these emissions, analysing trends, key drivers, and potential mitigation strategies based on recent studies and government reports. The energy sector is the dominant contributor, accounting for approximately 80% of South Africa's CO? emissions, primarily due to coal-based power generation.

Manufacturing, including steel and cement production, contributes significantly due to high energy consumption and process-related emissions. The transportation sector, driven by fossil fuel-dependent road and freight systems, adds to the emissions profile, though to a lesser extent. Emission trends show a steady increase over the past decade, with South Africa's per capita emissions among the highest in Africa. Key drivers include heavy reliance on coal, outdated infrastructure, and limited adoption of renewable energy. Mitigation strategies include transitioning to renewables like solar and wind, improving energy efficiency, and adopting carbon capture technologies. Policy democratisation, engaging communities, industries, and government in inclusive decision making can balance economic growth with emissions reduction. Technological interventions, such as green hydrogen and electrified transport, offer further potential. Implementing these measures is critical for sustainable development in South Africa.

Keywords: Coal Fired Plant; Transportation; Energy; Manufacturing; Greenhouse Gas