BRIEFING NOTE

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BUILDING CIRCULARITY INTO NATIONALLY DETERMINED CONTRIBUTIONS: PILOTING THE UN TOOLBOX IN SOUTH AFRICA

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KEY FINDINGS

This project aimed to explore the potential for circular economy interventions to reduce greenhouse gas emissions, thereby supporting future updates to South Africa's Nationally Determined Contributions. It found that implementing eight circular economy interventions in the building construction and civil engineering construction sub-sectors could reduce emissions by 12.3 MtCO2-eq, or 52% of current emissions in these sub-sectors.

INTRODUCTION

South Africa is the 12th largest contributor to greenhouse gas (GHG) emissions. In 2022, South Africa emitted 435.12 Megatonnes of CO_2 equivalent ($MtCO_2$-eq) (DFFE, 2024), accounting for 1% of global emissions.

Through more efficient and circular use of just a few key materials (including cement, steel, plastics and aluminium), **circular economy strategies can help reduce global GHG emissions by up to 50%** (EMF, 2021). The transition to a circular economy (CE) is therefore critical for mitigating climate change.

This study applied the United Nations' Toolbox for *Building Circularity into Nationally Determined Contributions (NDCs)* to South Africa. The aims were to pilot the Toolbox in the SA context, and to explore the potential for CE interventions to reduce emissions, thereby supporting future updates to SA's NDCs.

METHODOLOGY

The UN's NDC Toolbox offers a structured repository of online tools to assist policy-makers in identifying and assessing relevant circular economy opportunities for reducing GHG emissions. It aims to support countries to identify, prioritize, implement and track circular economy interventions for increased ambition and implementation of their NDCs. Specifically, it provides policy-makers with a methodology, resources, and tools to:

1. Assess and identify GHG emission hotspots from material use and establish entry points in their NDCs
2. Assess and select CE interventions, and adjust targets for the NDCs
3. Identify policy instruments and indicators for implementation
4. Track and report progress in the Biennial Transparency Report.

The Toolbox is organised into four stages associated with these four objectives. This study focused on piloting the initial stages of the Toolbox: Stage 1, which involves identifying hotpots of GHG emissions and material use, and Stage 2, which supports the preliminary selection and assessment of circular economy interventions. Subsequent steps, relating to policy options, financial instruments, and implementation; should be addressed in future work.

MAIN RESULTS

Based on a detailed analysis of hotspots of raw material use and GHG emissions across various sectors, **building construction and civil engineering construction were identified as priority sub-sectors for circular economy interventions to reduce GHG emissions**.

Emissions in these sub-sectors are largely driven by the use of carbon-intensive construction materials, such as cement (particularly in concrete) and steel.

A detailed assessment identified eight viable CE interventions that, if implemented, could reduce sectoral GHG emissions by 12.3 $MtCO_2$-eq, or 52% of current emissions in the building construction and civil engineering construction sub-sectors.

Two interventions, namely **substituting clinker with fly ash and bottom ash** and **switching to lower carbon fuels**, provide the highest potential emission reductions; with each reducing emissions by approximately 3.2 Mt, or 13.4% of total emissions in the building construction and civil engineering construction sub-sectors.

If implemented in combination, the **eight circular economy interventions could reduce GHG emissions by 12.3 MtCO_2-eq, or 52% of current emissions** in the building construction and civil engineering construction sub-sectors.

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Table 1: Summary of potential greenhouse emission reductions associated with eight circular economy interventions, ranked as a % of current emissions in the building construction and civil engineering construction sub-sectors.

Intervention	Reduction in GHG emissions (ktCO_2-eq)	Emission reduction as a % of current emissions in construction
Fly ash and bottom ash to replace clinker in cement production	3 198	13.42
Fuel switch to low-carbon fuels for cement production	3 190	13.39
Cement made from calcined clay instead of limestone clinker	1 950	8.19
Recycling and re-use of concrete and cement	1 740	7.30
Cement and concrete with intentionally introduced air voids	1 064	4.47
Cement substitution with wood waste	699	2.93
Ground granulated blast furnace slag to replace clinker in cement	468	1.96
Plastic waste as a partial replacement for bitumen in asphalt	4	0.01
Total	**12 313**	**51.69**

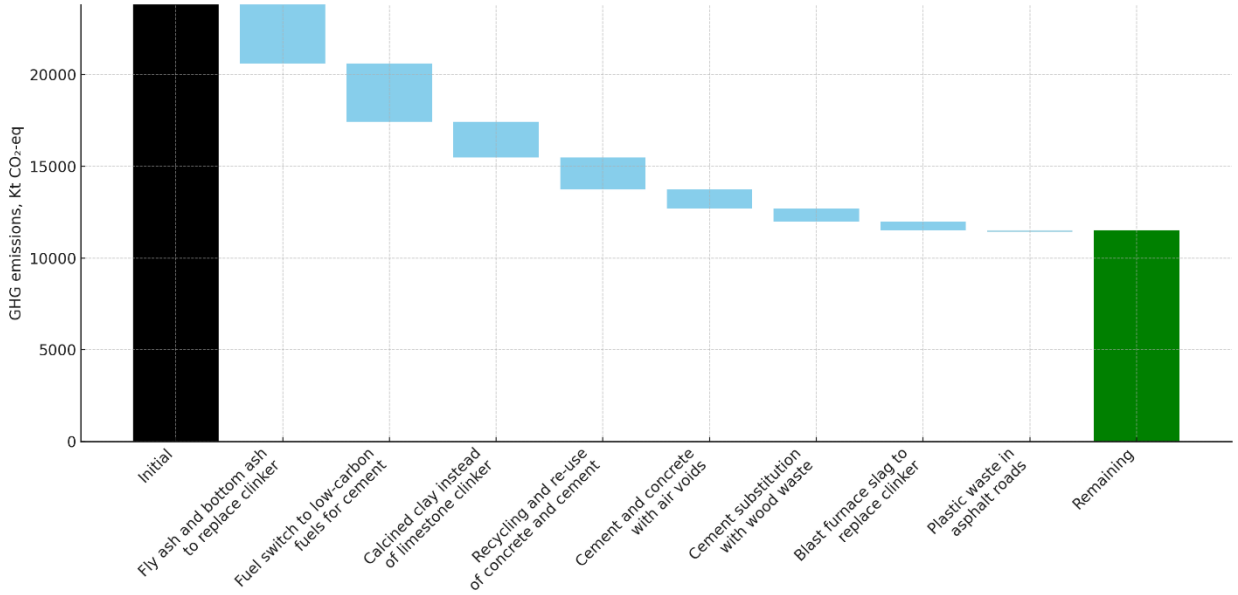

Figure 1. Potential emission reductions in building and civil engineering construction associated with the 8 interventions.

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