PhD opportunity
in Circular Economy Systems Modelling and Policy Design

Energy Systems Research Group
DEPARTMENT OF CHEMICAL ENGINEERING
FACULTY OF ENGINEERING AND THE BUILT ENVIRONMENT

Integrated Modelling of Sectoral Circular Economy Strategies and Policy Scenarios

About the Project

South Africa's economy is highly resource-intensive, with very low circular material use. This project develops a dynamic modelling framework that integrates material flow analysis (MFA) and life cycle assessment (LCA) into ESRG's SATIMGE energy–economy system model to embed circular economy indicators. The aim is to support evidence-based policy and scenario analysis for key industrial sectors, improving insights on material use, recycling, emissions, and circularity to guide South Africa's transition toward a low-carbon circular economy.

PhD Research Focus

- Advance circular economy (CE) scenario development for the aluminium, cement, steel, and plastics/chemicals sectors.
- Conduct detailed material flow analysis (MFA) and identify sector-specific CE strategies across key manufacturing industries.
- Develop cradle-to-gate life cycle assessment (LCA) models to quantify environmental intensities and resource-efficiency gains and integrate results into national assessments.
- Coordinate and harmonise data across tools (e.g., SATIMGE and SimaPro), ensuring methodological consistency.
- Rebuild the "Waste" model within SATIMGE to harmonise material flows with SATIM and eSAGE and derive dynamic MFA outputs and CE indicators.
- Utilise linkages between SATIM and the eSAGE CGE model to simulate macroeconomic outcomes (GDP, employment, trade) and co-develop CE-related economy-wide indicators.
- Co-develop and test policy scenarios (e.g., recycled-content mandates, landfill bans, circular-design incentives) in collaboration with national government, industry stakeholders, and the project modelling team.

Candidate Profile

- Qualification: Master's degree in chemical/environmental engineering, Industrial Ecology, or a related field.
- Skills: Experience in LCA, MFA, energy-economic or systems modelling; coding or simulation experience (e.g., Python, GAMS) advantageous.
- Attributes: Strong quantitative background, self-driven, with interest in sustainability transitions.

Scholarship Value and Duration

- Value: Scholarship at UCT's standard PhD rate for 2026 (R206 696), adjusted for inflation in subsequent years.
- Duration: 3 years (2026–2028).
- Mode: Full-time study only (no other employment except limited tutoring with supervisor approval).
- Funding Source: Circular Economy Science, Technology and Innovation Strategy (CE-STI), funded by the Department of Science, Technology and Innovation (DSTI) through the CSIR

Send a single PDF including your CV, academic transcripts and a one-page motivation letter to: Prof. Harro von Blottnitz (*harro.vonblottnitz@uct.ac.za).*

Application Deadline: Close of Business (CoB), Friday, 14 November
Start Date: January 2026