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Introduction

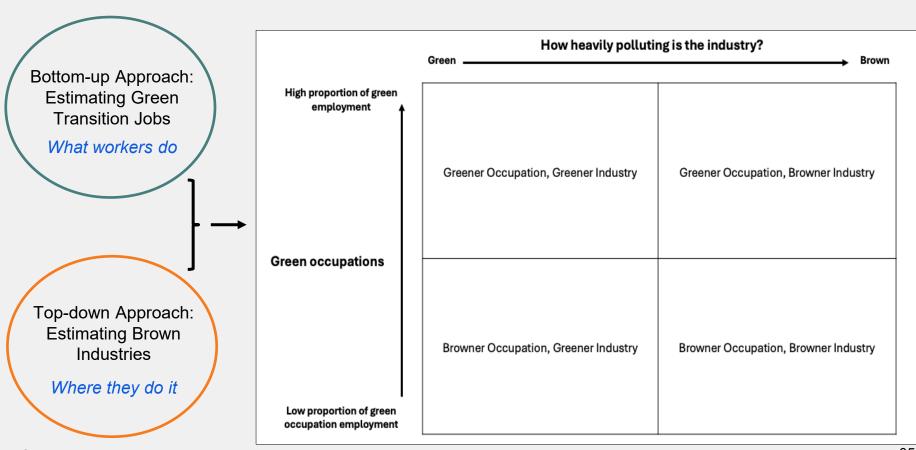- South Africa has committed to achieving a reduction of 350-420 million tonnes of CO_2 by 2030, which will have significant impacts on employment.
- South Africa's high unemployment, poverty and inequality rates compel the development of policy that ensures that the transition is just.
- We seek to provide an holistic, nuanced framework for analysing and contextualising the potential employment effects of the green transition, by bringing together two approaches to estimating green jobs:

> 1) a **bottom-up approach** to identifying **occupations** related to the green transition
> 2) a **top-down approach** to identifying 'brown' **industries**

- We arrive at a **matrix** that allows us to examine where on the nexus between green transition occupations, and brown industries, workers find themselves.
- We need to know both what workers do (their occupation), and where they do it (what industry they are in):

> A *logistics manager* in mining and quarrying will have the same green identification as a *logistics manager* in wholesale and retail trade, as their occupation codes are the same despite, being employed in different industries. Thus, knowing the 'brownness' of the industry is crucial in determining what the impact of the green transition may be on the worker, as the disruption will differ across industries.

The Framework

Bottom-up Approach: Estimating Green Transition Jobs

What workers do

Top-down Approach: Estimating Brown Industries

Where they do it

How heavily polluting is the industry?

Green →→→→→→→→→→→→→→→→→→ Brown

High proportion of green employment

Green occupations

Greener Occupation, Greener Industry	Greener Occupation, Browner Industry
Browner Occupation, Greener Industry	Browner Occupation, Browner Industry

Low proportion of green occupation employment

Bottom-up Approach: Green Transition Occupations

- We estimate **_green transition employment_** based on whether a worker's occupation is identified as green, as defined by the three O*NET categories of green transition occupations:

  1. **Green Increased Demand Occupations (GID)**: Increasing green economy activities and technologies results in increasing the employment demand for an existing occupation.
  2. **Green Enhanced Skills Occupations (GES):** Increasing green economy activities and technologies results in a significant change to the work and worker requirements of an existing occupation.
  3. **Green New and Emerging Occupations (GNE):** Increasing green economy activities and technologies is sufficient to create the need for unique work and worker requirements, resulting in the generation of a new occupation.

- This approach is referred to as 'occupational greening': the impact of the green transition on occupations.
- The 3 definitions of green transition employment allow for a nuanced analysis of what the impact of the transition might be on jobs.

Bottom-up Approach: Estimating Green Transition Jobs

There are 4 steps involved in the approach:

1. O*NET is a US-based system that does not match 1:1 with South African occupational classifications (OFO). We developed **a new crosswalk** to match the 8-digit O*NET green transition occupation classifications to the 6-digit OFO system.

2. South Africa has 2 different occupational classification systems: the OFO (6 & 4-digit) and SASCO (4-digit). This necessitates the calculation of a new ***occupational greenness* measure** for each occupation code, which is the proportion of 6-digit OFO green occupations in the 4-digit OFO occupation code.

3. The 4-digit OFO codes are crosswalked to the 4-digit SASCO codes using an existing crosswalk, for use with labour force survey data.

4. The *occupational greenness* measure of the 4-digit SASCO code is multiplied by the number of workers in that occupation to estimate the number of workers in ***green transition occupations*** within that occupation code.

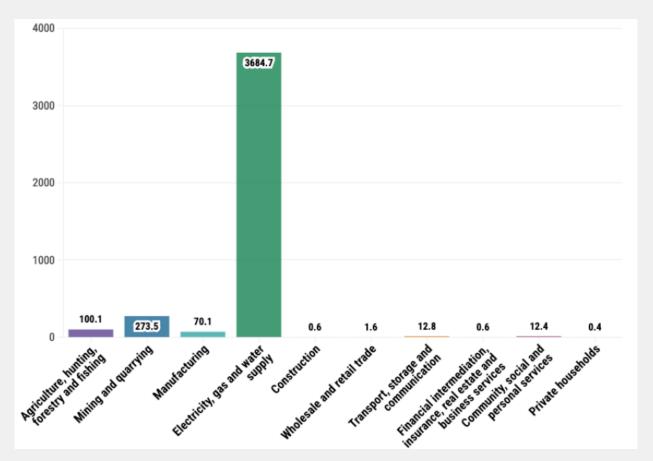# Bottom-up Approach: Green Transition Jobs in South Africa

	Green Transition Employment	Proportion of Total Employment
Green Increased Demand	765 436	4.6%
Green New and Emerging	160 241	1.0%
Green Enhanced Skill	580 471	3.5%
Total Green Transition (adj.)	1 449 370	8.7%

	Green Increased Demand	Green New and Emerging	Green Enhanced Skill	Total Green Transition (adj.)	Total Employed Population
African/Black	72%	54%	68%	69%	75%
Coloured	11%	9%	9%	10%	10%
Indian/Asian	3%	6%	4%	4%	3%
White	13%	31%	20%	17%	12%
Male	88%	77%	81%	84%	56%
Female	12%	23%	19%	16%	44%

Top-down Approach: Identifying Brown Industries

- Top-down approaches provide an environmental profile of employment based on **industry**.
- One strand of the literature focuses on defining 'brown' jobs, most often placing industries on a spectrum from green to brown based on carbon emissions.
- We identify brown industries using a variant of established Input-Output Analysis models: the Multi-Region Input-Output (MRIO) Materials Flows analysis.
- Input-Output tables are a quantitative economic technique that represents the interdependencies between different sectors of a national economy.
- Recent innovations in data collection have allowed for the incorporation of environmental factors as inputs for production and consumption processes, thereby, one is also able to estimate the emissions generated by each sector
- We use the **EXIOBASE 3 MRIO tables**, from which we extract the sectoral carbon emissions for the South African economy.
- Using this data, we estimate two measures:

      1) **Pollution intensity**: total carbon emissions per industry
      2) **Emissions intensity**: carbon emissions per worker for each industry
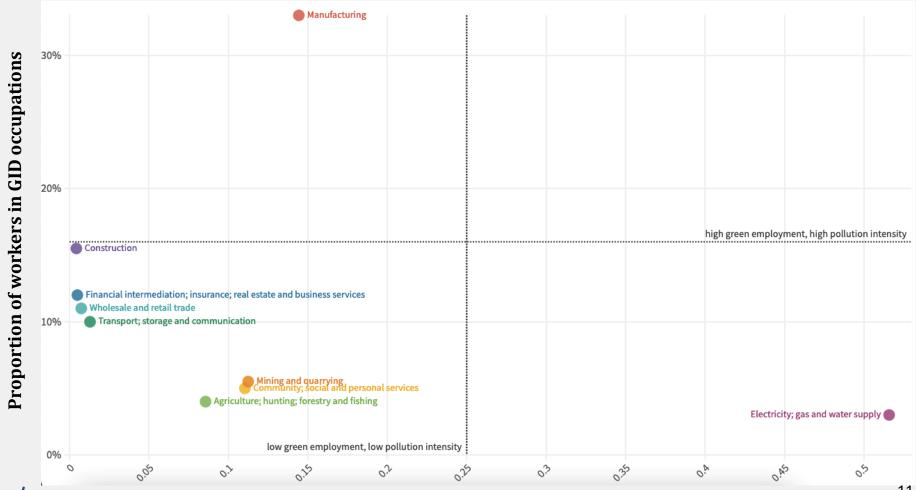
Top-down Approach: Emissions Intensity

Emissions intensity is defined as an industry's carbon emissions per worker.
It reflects the environmental impact of economic activities, and highlights how efficiently a sector is managing its emissions relative to its workforce.

The Electricity, gas and water supply industrial sector has the highest emissions intensity. It is far above the national emissions intensity (56 tonnes per worker).

Pollution intensity of the industry

Proportion of workers in GID occupations (y-axis)

- Manufacturing
- high green employment, high pollution intensity
- Construction
- Financial intermediation; insurance; real estate and business services
- Wholesale and retail trade
- Transport; storage and communication
- Mining and quarrying
- Community; social and personal services
- Agriculture; hunting; forestry and fishing
- Electricity; gas and water supply
- low green employment, low pollution intensity

x-axis values: 0, 0.05, 0.1, 0.15, 0.2, 0.25, 0.3, 0.35, 0.4, 0.45, 0.5

y-axis values: 0%, 10%, 20%, 30%

Percentage of workers by Green Increased Demand occupation and Emissions Intensity

	Green industries (below national CO2 per worker)	Brown industries (above national CO2 per worker)
100% GID occupations	2%	7%
50% GID occupations	1%	2%
Below 30% GID occupations	1%	2%

7% of all those working in brown industries with above national CO2 per worker are employed in wholly GID occupations, compared to only 2% in greener industries.

Thus, there is a relatively higher concentration of workers in GID occupations working in heavily polluting industries.

This suggests that 7% of workers who are in industries where job losses are expected due to the green transition, do jobs which could support the green economy.

As such, potentially not all workers in these vulnerable industries will face the same degree of vulnerability to the green transition.

Next steps

Forthcoming work

- A forthcoming paper explores spatialising the framework using Spatial Tax Panel data, facilitating place-based policy intervention. This utilizes the flexibility of the framework in the choice of the unit of analysis, being geographic regions (municipalities).
- Public release of the new O*NET/OFO crosswalk, and the bottom-up approach occupational *greenness measures.*
- Geographically mapping the indicators of green transition employment on the Explorers. (https://www.youthexplorer.org.za/)

Future work

- Carbon emission estimates at more detailed industrial sector levels.
- Trend analysis to differentiate between consistent and once off phenomena.
- Expand on the demographic profile of vulnerable workers identified by the framework.
- Occupational mobility: how does one define proximity in the labour market
- Location analyses: sectoral (formal/informal); geographic (urban/rural)

Q&A
Discussion

Thank you

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