GREEN SKILLS AND DIGITALISATION IN ADVANCING SOUTH AFRICA'S JUST ENERGY TRANSITION

T Swettenham[1], K Govindasamy[1], S Ramparsad[2]

[1]*The Research Institute for Innovation and Sustainability*, [2]SATCAP Programme (Mandela Mining Precinct)

June 2025

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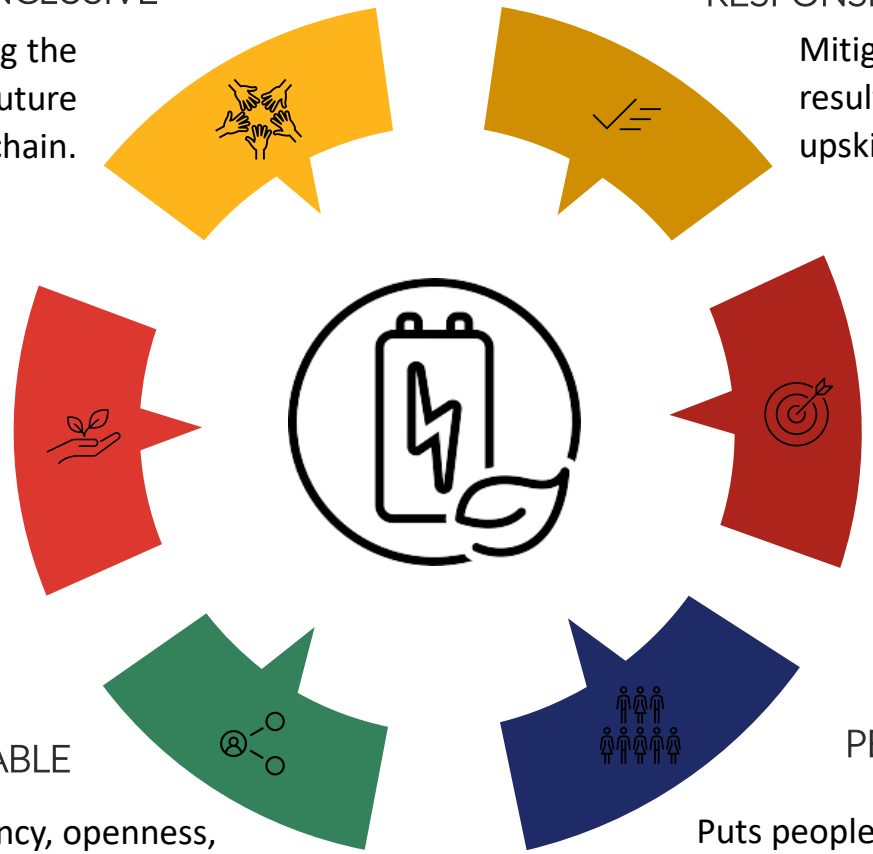
PILLARS OF A JUST TRANSITION FOR SOUTH AFRICA

INCLUSIVE

Assists stakeholders in understanding the impact of the energy transition on the future of work and supply chain.

RESPONSIBLE

Mitigates/ minimises potential job losses as a result of the transition, e.g., reskilling, upskilling and training programs for green jobs.



SUSTAINABLE

Contributes to the industry and economy's growth and sustainability.

SPECIFIC

Developed through a spatial lens, considering different just transition approaches in different regions.

EQUITABLE

Engages the principles of transparency, openness, impartiality and consensus, effectiveness and relevance, and coherence.

PEOPLE-CENTRIC

Puts people, especially those most impacted, at the centre of decision-making, i.e., the poor, women, people with disabilities and the youth.

Source: A Framework for a Just Transition in South Africa, Presidential Climate Commission, 2022.

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JUST ENERGY TRANSITION AND IMPACT ON JOBS

- Transition to low-carbon economy in South Africa is expected to result in **the loss of about 300 000 jobs**
- And **creation** of about 815 000 new jobs up to 2050
- Three critical sectors – **energy, mining and transport** significantly impacted by JET
- Predicted that most jobs will be lost during the early 2030s, when Sasol is expected to close its coal-to-liquid plants and sState-owned Eskom's coal-fired power stations will be decommissioned
- Spike in employment is expected from 2037 onwards when net gain in mining-related employment as demand for energy minerals and metals rise, needed to produce cleaner energy sources
- In transport which is the second-highest emitting sector, a shift toward electric vehicles is expected from the early 2030s, which will be aligned with the increase in the supply of more reliable and cleaner electricity

Source: World Bank and President Climate Commission, 2022.

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SKILLS DEVELOPMENT AND OPPORTUNITIES FOR GREEN JOBS

Green skills are defined as “the knowledge, abilities, values and attitudes needed to live in, develop and support a sustainable and resource-efficient society” (OECD/CEDEFOP, 2014). Green skills include environmental awareness, STEM (science, technology, engineering and maths), digital skills and research skills.

Job-positive opportunities in the following areas could be unlocked through **re-skilling efforts, revisions to technical & academic curricula** and **redeployment with relocation support:**

1. **Manufacturing/Construction:**
   Manufacturing/ construction of fuel-efficient/ green machinery, equipment and infrastructure.
2. **Renewable Energy:**
   Production of green hydrogen, solar PV, wind energy, etc.
3. **Agriculture:**
   Involvement in green/ sustainable farming initiatives
4. **Other:**
   Transportation, recycling, forestry, textiles and tourism.

- **Energy Transition:** South Africa is heavily reliant on coal for energy. Green skills are essential for developing and implementing renewable energy solutions like solar, wind, and hydropower.
- **Job Creation:** The green economy offers significant opportunities for job creation in areas such as clean energy, waste management, sustainable agriculture, and conservation.
- **Climate Action:** Green skills equip workers to design, implement, and maintain eco-friendly technologies and practices, reducing carbon footprints and meeting international climate commitments.
- **Sustainable Development Goals (SDGs):** These skills align with global goals, enabling South Africa to achieve sustainable growth while improving social equity and environmental protection.

Source: Generic Green Skills for TVET, greenskillresources.com, 2023.

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PROGRAMMES INTEGRATING DIGITALISATION WITH GREEN SKILLS

TVET College Programmes (Technical and Vocational Education and Training)

Focus: Mechatronics, industrial automation, environmental management, digital instrumentation.

Green Skills: Energy-efficient operations, environmental monitoring, and pollution control.

Digital Skills: PLC programming, SCADA systems, IoT integration for mining equipment.

BEng/BSc in Mining Engineering with Digital & Sustainability Modules:

Mine digitalisation.
Artificial intelligence in mineral extraction.
GIS and remote sensing for environmental compliance.
Energy-efficient design in underground and open-pit mines.

Postgraduate Diplomas and Master's Degrees:

Master's in Sustainable Mining or Environmental Engineering.
Digital transformation in extractive industries.

Learnerships & Apprenticeships (Accredited by SETAs)

- **Mining Qualifications Authority (MQA)** programmes:
  - Learnerships that include modules on automation, clean technology, and environmental best practices.
  - Practical experience with sensors, digital monitoring tools, and smart PPE.

Short Courses / Micro-Credentials

- Offered by mining houses or partnerships with institutions like Wits Mining Institute:
- Digital Twin technology for mines.
- Smart mining operations.
- Green hydrogen and clean energy integration.
- Environmental impact modelling using software (e.g., ArcGIS, ERDAS).

Source: Generic Green Skills for TVET, greenskillresources.com, 2023.

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INFORMAL DIGITAL SKILLS DEVELOPMENT PROGRAMMES

On-the-Job Training & Peer Demonstrations

Use of handheld digital devices for real-time reporting on environmental parameters (dust, gas levels, water contamination).

Training on digital platforms for compliance and reporting (e.g., cloud-based ESG dashboards).

Remote control of equipment and machinery via VR or AR simulations.

Technology demonstrators and simulators

Demonstrations by tech providers (e.g., ABB, Siemens, Schneider Electric) on green automation tools.

Hands-on experience with drones for site inspections, thermal imaging for leak detection, and AI for ore quality prediction.

Community-Based Training Initiatives

- Localised training for artisanal and small-scale miners on eco-friendly practices and digital monitoring.
- Use of mobile classrooms or training trailers equipped with digital simulation tools.
- Mobile labs and coding skills

Digital Bootcamps / Hackathons

- Held in collaboration with universities, mining companies, and innovation hubs.
- Focus areas:
  - Data analysis for environmental forecasting.
  - Development of apps to track mine worker safety and emissions.
  - Prototyping of digital ESG (Environmental, Social, Governance) tools

Source: Generic Green Skills for TVET, greenskillresources.com, 2023.

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Challenges in Digitalizing Green Skills Training

Navigating Obstacles to Effective Implementation

Technological Barriers

Issues such as lack of infrastructure, insufficient digital literacy, and inadequate resources can hinder the effective adoption of digital training for green skills.

Access and Equity Issues

Disparities in access to technology and training opportunities can exacerbate existing inequalities, leaving certain demographics at a disadvantage.

Resistance to Change

Cultural resistance from traditional training methods may impede the integration of innovative digital tools and practices in the training landscape.

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Future Trends in Green Skills and Digital Training

Anticipating Changes and Innovations

Emerging Technologies

Innovations such as artificial intelligence, machine learning, and blockchain are poised to transform the training landscape, providing tailored learning experiences and increased efficiency.

Predicted Job Market Shifts

The evolution of green technologies will create new job categories, requiring specialized green skills as industries evolve to meet sustainability mandates.

Role of Policy in Shaping Training

Policy frameworks will play a crucial role in promoting the integration of green skills in digital training, ensuring alignment with sustainability goals at national and international levels.