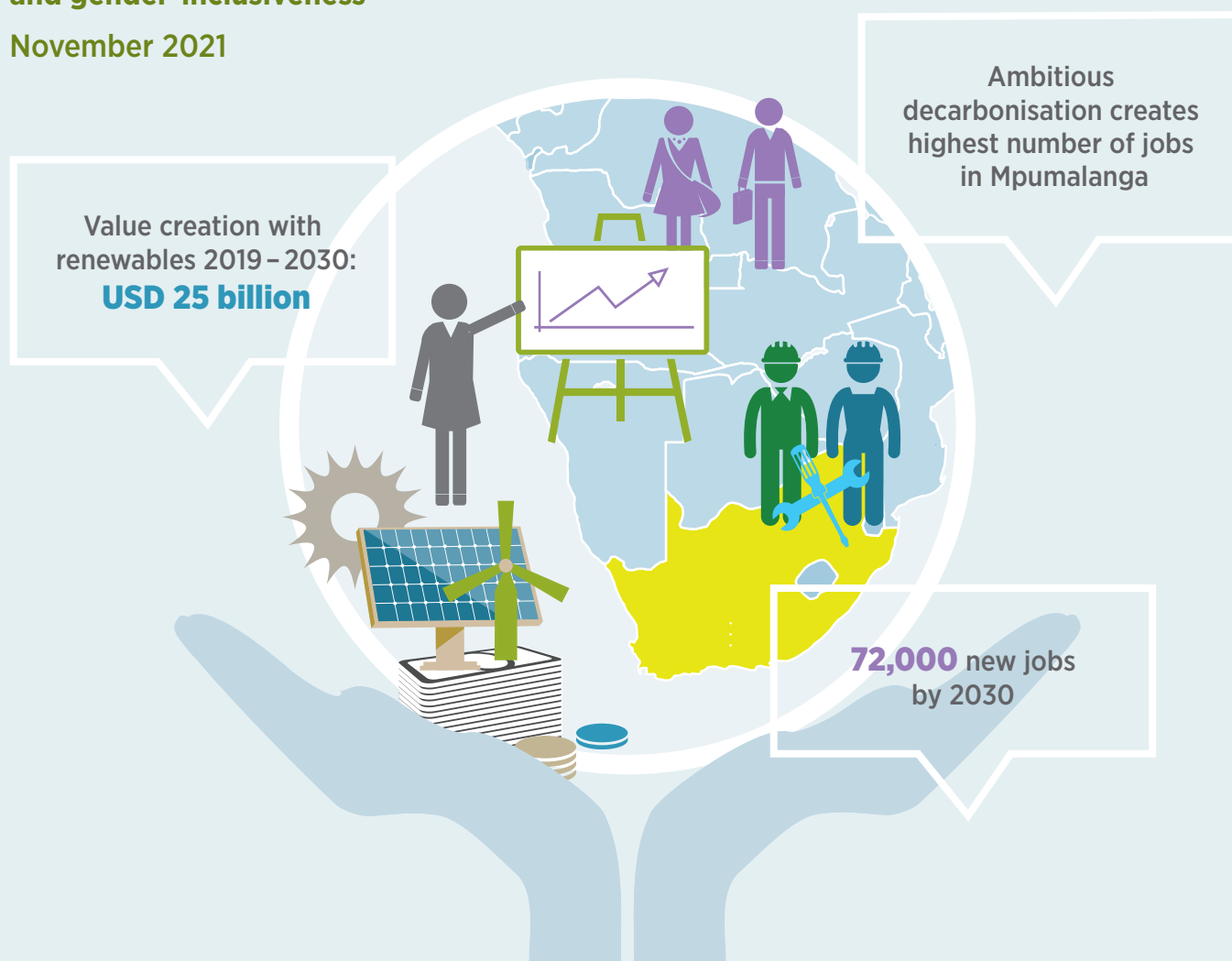


## MAKING THE PARIS AGREEMENT A SUCCESS FOR THE PLANET AND THE PEOPLE OF SOUTH AFRICA

**COP26 Briefing:**  
**From coal to renewables in Mpumalanga:**  
**Economic impacts, skill requirements**  
**and gender-inclusiveness**

November 2021

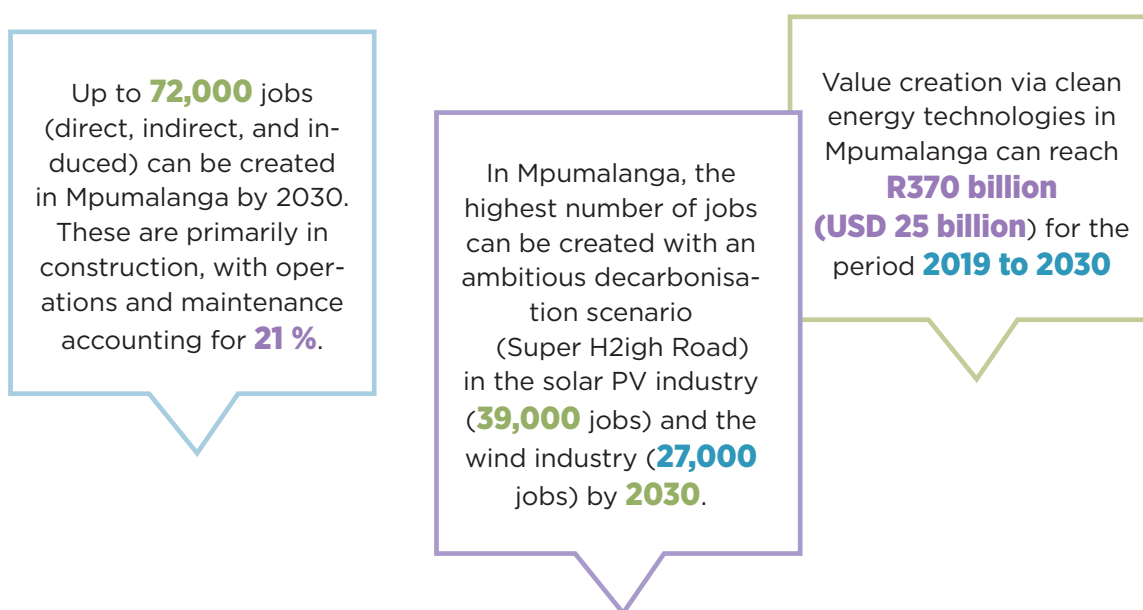


### COBENEFITS South Africa

‘Economic impacts, skill requirements and gender-inclusiveness: Renewable energy deployment in Mpumalanga, South Africa’, prepared by CSIR, Enertrag, Prime Africa, and Navitas Energy, and published by IET and IASS.

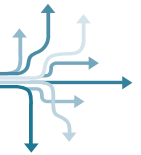
## Key policy opportunities:

- Policy opportunity 1: Mpumalanga can compensate a large share of job<sup>1</sup> losses in the declining coal sector by investing in renewable energies.** Under the Super H2igh Road Scenario, almost three times more jobs can be created in Mpumalanga by 2030 than under the current IRP 2019 scenario (72,405 jobs versus 27,045 jobs). However, not all job losses in the fossil fuel sector can be compensated for by clean energy jobs in Mpumalanga. The decommissioning process is estimated to result in net job losses in the province by 2030. Therefore, a wider strategy for economic growth is needed, including other sectors such as tourism and agriculture.
- Policy opportunity 2: By deploying renewable and clean energy technologies, Mpumalanga can lay the foundation for becoming the new clean energy hub of South Africa. Mpumalanga's gross output value<sup>2</sup> can be increased substantially.** Between 2019 and 2030, cumulative renewable energy investment in Mpumalanga can reach R346 billion (USD 23 billion) in the Super H2igh Road scenario, a 193% increase over the R118 billion (USD 8 billion) in the IRP 2019 scenario. By increasing local content requirements (LCR: i.e., the percentage of intermediate goods sourced from domestic supply chains) from 30% at present to 60–80%, gross output value in Mpumalanga can be further increased to R370 billion (USD 25 billion) in the Super H2igh Road Scenario.
- Policy opportunity 3: The transition from fossil fuels to clean energy sources is an opportunity to improve conditions for women working in the energy sector in Mpumalanga. Currently, women are under-represented in the energy sector.** Mpumalanga has low educational attainment, i.e., 11% of the population hold a post-matriculation degree. Women could be educated and empowered by establishing dedicated programs at TVET (Technical Vocational Education and Training) colleges and by providing childcare facilities close to training centres. Existing initiatives to mentor and coach young women in the renewable sector should be further enhanced.



<sup>1</sup> This study defines a 'job' or 'employment opportunity' in terms of full-time equivalent (FTE) units per annum. This approach accounts for part-time and full-time workers in a comparable way. One job is equivalent to one job year, with the total number of jobs indicating the total number of people employed during a specific year.

<sup>2</sup> Gross output is a measure of total economic activity. It includes payments that industries and businesses make to one another for inputs used in production. Such inputs could include raw materials, services, or anything that a business purchases to produce its goods or services. Gross output also includes value added (Definition from NREL)



## South Africa's NDC ambition to deliver social and economic co-benefits: Building the database

In October 2021, South Africa registered its new National Determined Contributions (NDCs) at the UNFCCC as its contribution to the global action on climate change. After initially announcing to limit greenhouse gas (GHG) emissions to 398–440 MtCO<sub>2</sub>e in March 2021, there was a general consensus by business and civil society stakeholders that the Department of Forestry, Fisheries & the Environment (DFFE) had not been sufficiently ambitious, which led to a revision in the announcement in September 2021 of a limit of 350–420 MtCO<sub>2</sub>e by 2030. Whilst these new targets were welcomed, their attainment will be conditional on South Africa receiving appropriate financial support from developed nations and—even more importantly—on the ability of the South African political economy to address the agenda of both existing vested interests in fossil fuels and the requirements for a just transition.

Coal has contributed to the South African economy for more than a century and remains a dominant part of the energy mix. Mpumalanga is the centre of the South African coal industry, accounting for approximately 80% of total coal production. Consequently, most of Eskom's (Electricity Supply Commission, the public electricity utility) coal-fired plants are also located in the province. Consequently, Mpumalanga's regional economy is highly dependent on the exploitation of coal.

However, the transformation of the South African energy system is gathering momentum. The Integrated Resource Plan (IRP) 2019 anticipates that some 11 GW of existing coal power stations will be decommissioned by 2030, with only Medupi and Kusile expected to remain operational by 2040. According to the DFFE, about 80–90% of greenhouse gas emission reductions in South Africa should come from the power sector, as it is both the largest emitter and also the cheapest sector to mitigate in due to declining renewable energy (RE) prices.

Without deliberate and appropriate planning, the gradual phase-out of coal is expected to lead to substantial economic and socio-economic losses. A regional and national plan is therefore needed to ensure that this process meets the principles of a just transition, which include social inclusion, decent work for all, and poverty reduction.

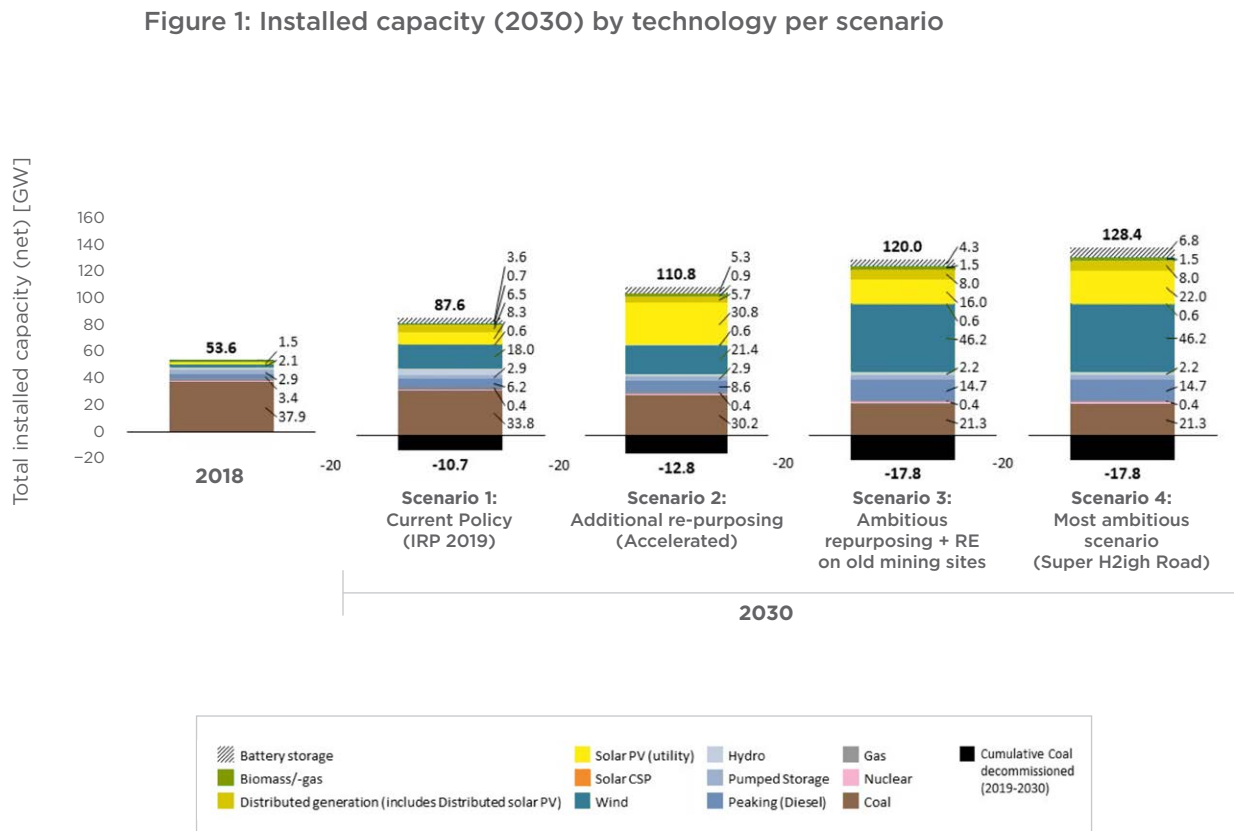
As part of Eskom's Social Plan, the utility is considering options for repurposing the sites of coal-fired power plants that are scheduled for decommissioning, namely Camden, Grootvlei, Komati, and Hendrina, and also (potentially) a single unit at Arnot (Eskom Holdings SOC Ltd, n.d.) (Fabricius et al. 2020)<sup>3</sup>.

This study analyses and quantifies the socio-economic implications of re-purposing coal-fired plants in Mpumalanga via deployment of renewable energy. The analysis emphasises opportunities related to job creation, necessary skill development with a focus on gender questions, and regional value creation and industrial opportunities in Mpumalanga. The study also highlights important framework conditions necessary for fully harnessing these benefits.

The analysis examines potential socio-economic impacts until 2030, via four scenarios depicting an increasingly ambitious and rapid energy transition. Scenario 1, termed Planned re-purposing (IRP), assumes the scheduled decommissioning of power stations as per the IRP 2019. Scenario 2, Additional re-purposing (Accelerated), assumes quicker decommissioning of additional coal-fired power plants in Mpumalanga, building on the Ambitious RE scenario from Wright & Calitz (2020).<sup>4</sup> Scenario 3, Ambitious repurposing and RE on old mining sites, is based on quicker decommissioning and re-purposing of additional coal-fired plants and the conversion of former coal-mining land via renewable energy deployment. Scenario 4, the Super H2igh Road Scenario, is based on the same decommissioning assumptions as scenario 3 but also includes additional renewable energy capacity for hydrogen production.

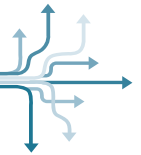
<sup>3</sup> Fabricius, Callie, Ntokozo Sigwebela, Sonwabo Damba, and Prudence Rambau. 220AD. "Medium-Term System Adequacy Outlook 2020," no. October: 24.

<sup>4</sup> Wright, Jarrad, and Joanne Calitz. 2020. "Systems Analysis to Support Increasingly Ambitious CO<sub>2</sub> Emissions Scenarios in the South African Electricity System." Tech. Rep. 27 (July): 129.



Source: IRP 2019. CSIR Energy Centre analysis

The study employs quantitative and qualitative methods. Quantitative analysis is used to estimate the gross impacts of increased renewable energy deployment arising from each scenario, utilising both the International Jobs and Economic Development Impacts (I-JEDI) modelling tool and desktop literature to estimate the additional jobs/MW associated with distributed solar PV and battery storage. The qualitative analysis included a review of the existing literature together with inputs from industry experts, to provide a perspective on resource potential plus transmission capacity-, land-related-, and mining employment considerations. Employee data for Eskom and coal mines were sourced from Eskom and the Mining Quality Authority (MQA), respectively. In addition, interviews were conducted with Enterprise Development (ED) managers to understand barriers and opportunities for women in the renewables sector.



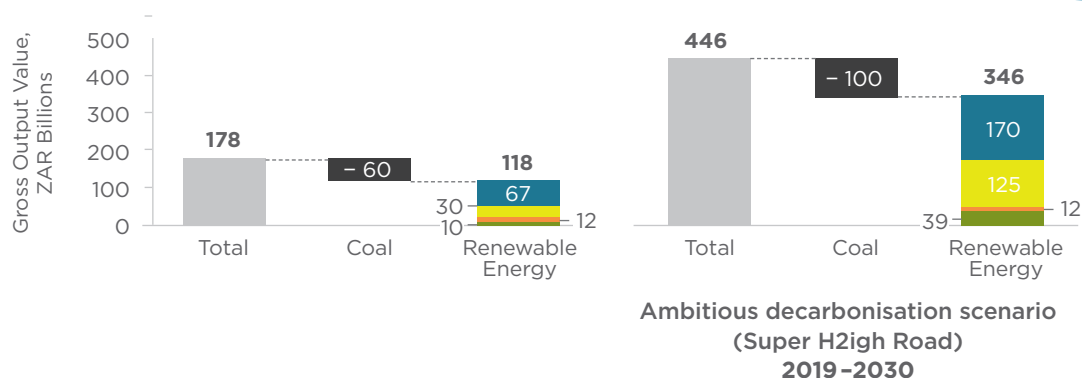
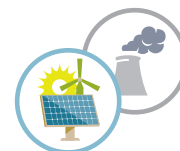
## Key Findings:

- **Employment:** In South Africa as a whole, job creation through renewables exceeds anticipated job losses in the coal sector.<sup>5</sup> In Mpumalanga, not all job losses in the fossil fuel sector can be compensated by clean energy jobs; however, under an ambitious decarbonisation scenario, these net losses can be minimised: Under the Super H2igh Road Scenario, almost three times more jobs can be created than under the current IRP 2019 scenario (72,405 jobs versus 27,045 jobs by 2030).
- **Employment:** The two most important technologies for the energy transition in South Africa and Mpumalanga will be wind energy and solar PV. These technologies will also make the largest contributions to job creation, with up to 39,378 jobs in Solar PV and 26,498 in wind-energy-related jobs in Mpumalanga by 2030 (Super H2igh Road Scenario).
- **Employment:** Biomass creates the most jobs on a per-MW basis. However, the restricted potential for sustainably produced biomass and the competition for biomass use from other sectors limits scalability. In total, 4,431 jobs can be created in the biomass sector under the Super H2igh Road Scenario by 2030. A detailed analysis of the sustainable biomass potential in Mpumalanga is necessary.
- **Employment:** The number of jobs lost in the coal sector (operation and maintenance jobs) will depend on the number of power plants decommissioned. Therefore, any accelerated schedule for decommissioning coal needs to be accompanied by faster upscaling of renewable and clean technologies. In the IRP 2019 scenario, 74,116 O&M jobs (10.7 GW coal is decommissioned) would be lost at coal-fired power stations, compared with 123,609 O&M jobs in scenarios 3 and 4 (17.8 GW coal is decommissioned). The reductions in O&M jobs are cumulative for the period 2019 to 2030. However, not all job losses in Mpumalanga's fossil fuel sector can be compensated by clean energy jobs. The decommissioning results in net job losses in the province by 2030. Therefore, a wider strategy for economic growth is needed, including other sectors such as tourism and agriculture.
- **Employment:** Direct job losses in the Mpumalanga coal sector are lower than total job losses (direct, indirect, and induced). Job losses at Eskom power stations range from 6,537 jobs in the IRP2019 scenario to 10,903 in scenarios 3 and 4. Direct job losses related to coal mining range from 4,826 in the IRP2019 to 8,049 in scenarios 3 and 4.
- **Value Creation with Renewables:** By deploying renewables, Mpumalanga's gross output value can be increased substantially. Between 2019 and 2030, renewable energy investment in Mpumalanga can reach R346 billion (USD 23 billion) in the Super H2igh Road scenario, a 193% increase over the R114 billion (USD 8 billion) in the IRP 2019 scenario. By increasing the local content from 30% today to 60–80%, local content within the province can be further increased to a gross output value of R370 billion (USD 25 billion).

<sup>5</sup> IASS/CSIR/IET (2019). Future skills and job creation through renewable energy in South Africa. Assessing the co-benefits of decarbonising the power sector. Potsdam/Pretoria: IASS/CSIR/IET. <https://www.cobenefits.info/resources/cobenefits-south-africa-jobs-skills/>

**Key Infographic:**

By moving from current policy to an ambitious decarbonisation scenario, renewable-energy-related value creation in Mpumalanga can increase from R118 bn to R346 bn in the next ten years.

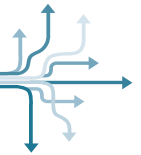


■ Coal ■ Wind ■ Utility solar PV ■ Distributed solar PV ■ Biomass



The energy transition in Mpumalanga is also a chance to employ more women, who are currently underrepresented in the power sector. © Shutterstock





## Key Findings (continued):

- **Value Creation:** Value creation in Mpumalanga will primarily be driven by manufacturing, amounting to approximately 20–30% of total value creation in all scenarios. The other parts of the value chain account for 7–12% of value creation (construction, componentry, financial, professional & business services [15–25%]);
- **Skills:** Upskilling and higher education are pre-requisites for a successful energy transition in Mpumalanga. The bulk of job creation in renewable energy is within the high-skilled labour group (estimated as 68–80%), although employment is also created in low-skilled roles—especially during project construction phases.
- **Skills:** The current educational level among coal workers is much higher than the provincial average: 22% of coal-mining employees, and 55% of Eskom employees have post-matric qualifications, compared with only 11% among Mpumalanga’s working-age population as a whole. Eskom employees often acquire technical skills on the job, as 36% are technicians and associated professionals. Although coal workers overall have lower levels of education compared to Eskom employees, they also acquire technical skills on the job (e.g., 43% are plant and machine operators), and their skills could be utilised in the renewables sector—especially during project construction phases.
- **Skills and Gender:** Women are presently underrepresented in the energy sector. According to Eskom and MQA data sets, Eskom employs 29% females and coal mines employs 21% females in Mpumalanga. However, those female employees are usually better educated than their male colleagues (e.g., 67% of females compared to 49% of males at Eskom hold a post-matric qualification), which results in females holding proportionately higher positions despite being underrepresented in absolute terms. Female underrepresentation is currently far worse in South Africa’s renewable energy sector, where women account for only 10% of employees.

## KEY POLICY RECOMMENDATION/HIGH-IMPACT ACTION

### ■ High impact action 1: Establish a coherent clean energy industry policy for Mpumalanga

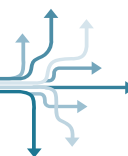
Institution to champion the Action	Collaborative bodies to successfully implement the Action	Timeframe of the Action
Department of Minerals and Energy	Department of Trade, Industry and Competition	Short term, over the next 2 – 3 years

A coherent clean energy industry policy needs to be established for Mpumalanga to create job opportunities and a framework for provincial value creation. There needs to be co-ordination of efforts at all levels—spanning local, provincial, and national tiers of government—with the local and provincial governments driving the initiatives and plans for the province. A coherent strategy is required between the Mpumalanga government, local municipalities, DMRE, DTIC, and DFFE concerning renewable energy value chains, to drive development of the green economy.

The policy framework for the sector needs to include both “push” and “pull” elements. To push the provincial clean energy industry, Special Economic Zones (SEZ) can be established. This can provide an attractive environment for companies that provide the balance of electrical plant components, e.g., transformers, switchgear, and cabling, which together comprise 60–65% of plant value and are already manufactured competitively in South Africa. The Nkomazi SEZ in Mpumalanga provides incentives for the green economy and can ensure that these companies are prioritised.

In terms of “pull” elements, regional procurement of renewable and clean energy technologies should be considered. This could be introduced as a short-term measure until the renewable energy market in Mpumalanga, including private off-take opportunities, is well established. At the same time, local content requirements can help to ensure a minimum level of local content, thereby capturing value from the parts of the value chains where South Africa has a competitive advantage. Measures need to be established to ensure increased local content in private project procurement (projects that sell to private off-takers [i.e., energy purchasers], as opposed to procurement through REIPPPP).





## ■ High impact action 2: Renewable Energy skill development programmes through TVET colleges

Institution to champion the Action	Collaborative bodies to successfully implement the Action	Timeframe of the Action
Department of Higher Education and Training	Department of Basic Education; Department of Science & Innovation; Eskom	Short term, over the next five years
	Private sectors (Manufacturing Circle/BUSA)	

The renewable energy sector requires a variety of technical skill levels, with some level of training specific to each technology. Data show that only 11% of the Mpumalanga population have a post-matric qualification; however, 65% of the population have a secondary qualification and it is believed that this group can benefit from a career path through TVET colleges, for which Grade 9 is the minimum admission requirement. The province has three public TVET colleges that provide civil- and electrical engineering-related courses, and trade-related courses (in the engineering and construction industries). These courses provide skills relevant to careers within the RE sector, especially during the manufacturing and construction phases of projects.

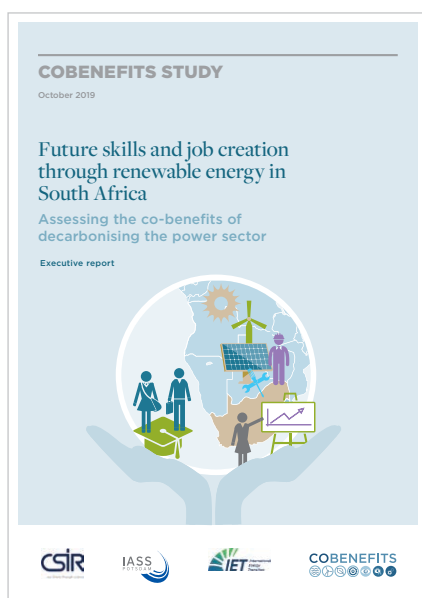
Nevertheless, more specialised courses are needed, focused on the RE sector (e.g., wind turbine technician). Such courses are provided by the South African Renewable Energy Technology Centre (SARETEC) based in the Western Cape province, and it is believed that collaboration between this training facility and TVET colleges is crucial for expanding these types of career opportunities to more people. Collaboration on developing training courses should include the Department of Higher Education and Training (DHET), OEMs, EPCs and district and local municipalities, and should be implemented in two phases. In Phase 1, courses to be developed should resemble those offered by SARETEC, although admission will require a higher level of education, particularly with a university degree. Phase 2 should focus on establishing skills-development programmes, and should target population groups with lower educational attainment (i.e., Grade 12- Grade 9). Phase 2 will train workers in assisting engineers and trade workers artisans; as these workers gain experience and skills, they could enrol in courses as described in Phase 1.

Coal workers typically have low levels of education compared to Eskom workers, but they do have on-the-job training skills, thereby necessitating appropriate assessment of their abilities via Prior Learning Recognition (PLR). PLR is a process through which non-formal learning is measured for recognition across different contexts and certified against the requirements for advancement in the formal education and training system. This process will be powerful in providing these workers with a formal education certificate, and should be conducted through collaboration with DMRE, relevant SETAs (i.e., MQA and MerSETA) and DHET.

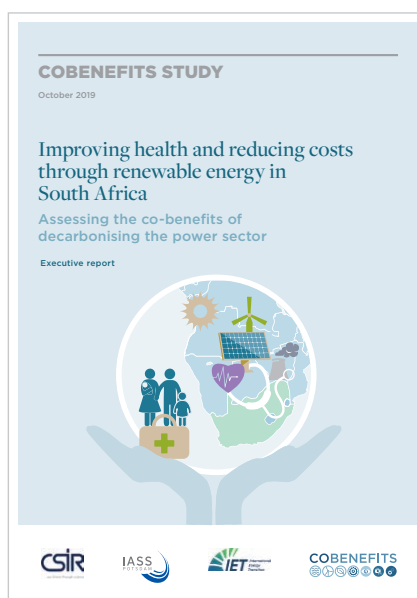
## COBENEFITS assessments in South Africa

In South Africa, the project is guided by the Council for Scientific and Industrial Research's (CSIR) and a council consisting of representatives of the Department of Environmental Affairs (DEA), Department of Energy (DoE), Department of Trade and Industry (DTI), Department of Science and Technologies (DST), and the IPP Office.

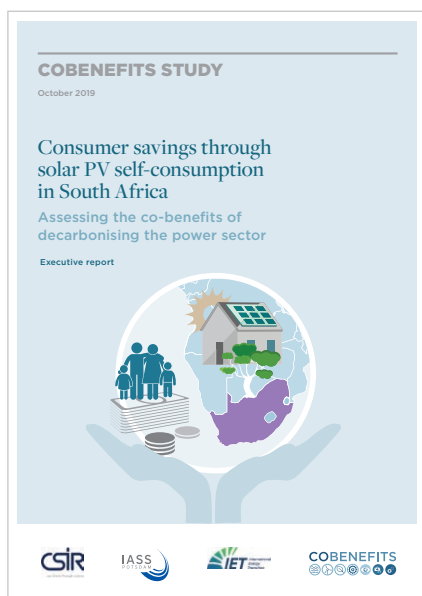
COBENEFITS has assessed important social and economic co-benefits of increasing the shares of carbon-neutral renewable energy in South Africa's power systems. Building on these assessment results, the project consortium has worked with the government of South Africa to develop policy options to unlock these co-benefits for the countries' citizens and businesses. The results of the co-benefits assessments have been published in the COBENEFITS South Africa Study series, which can be downloaded from [www.cobenefits.info](http://www.cobenefits.info)



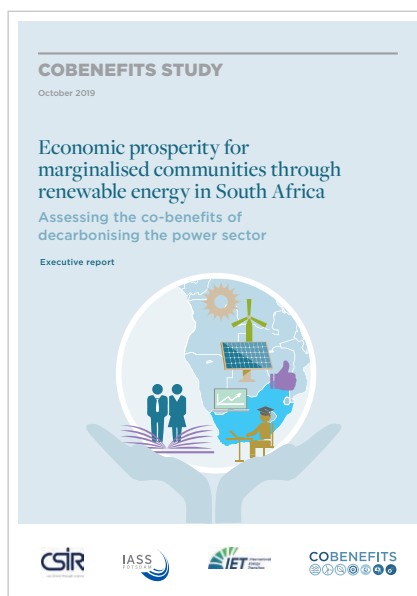
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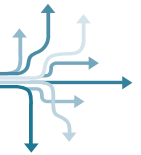
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## COBENEFITS: Unlocking social and economic co-benefits for a just and sustainable energy future

**The COBENEFITS project** supports national authorities and knowledge partners in countries worldwide to connect social and economic co-benefits of decarbonising the power sector to national development priorities and to mobilise these co-benefits for early and ambitious climate action. The project supports efforts to develop enhanced NDCs with the ambition to deliver on the Paris Agreement and the 2030 Agenda on Sustainable Development (SDGs) and to enable a just transition.

**COBENEFITS** facilitates international mutual learning and capacity building among policymakers, knowledge partners, and multipliers through a range of connected measures: country-specific co-benefits assessments, online and face-to-face training, and policy dialogue sessions on enabling policy options and overcoming barriers to unlock the identified co-benefits in the target countries.

**COBENEFITS** is part of the International Climate Initiative (IKI). The Federal Ministry for the Environment, Nature Conservation, and Nuclear Safety (BMU) supports this initiative on the basis of a decision adopted by the German Bundestag. The project is coordinated by the Institute for Advanced Sustainability Studies (IASS, Lead) in partnership with the Renewables Academy (RENAC), Independent Institute for Environmental Issues (UfU), and International Energy Transition GmbH (IET).

Reports and infographics available on [www.cobenefits.info](http://www.cobenefits.info)

## Upcoming COBENEFITS report

This COP26 briefing summarises key findings from the upcoming COBENEFITS report ‘Economic impacts, skill requirements and gender-inclusiveness: Renewable energy deployment in Mpumalanga, South Africa’, prepared by CSIR, Enertrag, Prime Africa, and Navitas Energy, and edited by IET and IASS. The report will be published in early 2022.



**Additional policy opportunities** to unlock co-benefits of decarbonizing the power sector in South Africa can be found in our COBENEFITS Policy Report “Making the Paris Agreement a success for the planet and the people of South Africa”.

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