COBENEFITS of the new energy world of renewables for the people in South Africa

South Africa is in the midst of an energy transition, with important social and economic implications, depending on the pathways that are chosen. Economic prosperity, business and employment opportunities as well as health impacts, issues related to the water–energy–food nexus and global warming impacts: through its energy pathway, South Africa will define the basis for its future development. Political decisions on South Africa's energy future link the missions and mandates of many government departments beyond energy, such as environment, industry development, science and technological innovation.

Importantly, the whole debate boils down to a single question: **How can renewables improve the lives of the people in South Africa?** Substantiated by scientific rigor and key technical data, the study at hand contributes to answering this question. It also provides guidance to government departments and agencies on further shaping an enabling environment to maximize the social and economic co-benefits of the new energy world of renewables for the people of South Africa.

Under their shared responsibility, the CSIR Energy Centre (as the COBENEFITS South Africa Focal Point) and IASS Potsdam invited the Department of Environmental Affairs (DEA) and Department of Energy (DoE), together with the Independent Power Producers (IPP) Office, the Department of Trade and Industry (DTI), Department of Science and Technology (DST) and the South African National Energy Development Institute (SANEDI) to constitute to the COBENEFITS Council South Africa in May 2017 and to guide the COBENEFITS Assessment studies along with the COBENEFITS Training programme and political roundtables.

We particularly highlight and acknowledge the strong dedication and strategic guidance of the COBENEFITS Council members: Olga Chauke (DEA); Nomawethu Qase (DoE); Gerhard Fourie (DTI); and Lolette Kritzinger-van Niekerk, Frisky Domingues, Thulisile Dlamini and Lazarus Mahlangu (IPP Office). Their contributions during the COBENEFITS Council sessions guided the project team to frame the topics of the COBENEFITS Assessment for South Africa and to ensure their direct connection to the current political deliberations and policy frameworks of their respective departments. We are also indebted to our highly valued research and knowledge partners, for their unwavering commitment and dedicated work on the technical implementation of this study. The COBENEFITS study at hand has been facilitated through financial support from the International Climate Initiative of Germany.

South Africa, among 185 parties to date, has ratified the Paris Agreement, to combat climate change and provide current and future generations with opportunities to flourish. Under the guidance of the National Planning Commission, municipalities, entrepreneurs, citizens and policymakers are debating pathways to achieve a just transition to a low-carbon, climate-resilient economy and society in South Africa. With this study, we seek to contribute to these important deliberations by offering a scientific basis for harnessing the social and economic co-benefits of building a low-carbon, renewable energy system while facilitating a just transition, thereby **making the Paris Agreement a success for the planet and the people of South Africa**.

We wish the reader inspiration for the important debate on a just and sustainable energy future for South Africa!

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Executive Summary

COBENEFITS

Improving health and reducing costs through renewable energy in South Africa

Assessing the co-benefits of decarbonising the power sector

Air pollution, primarily from coal-fired power plants, is one of the main impacts that the energy sector has on the environment and human health. These pollutants have many negative impacts, of which those of greatest concern include heart disease, lung cancer, stroke and chronic obstructive pulmonary disease (WHO, 2016). The consequences of such diseases include increased levels of morbidity, which further result in elevated health costs and losses of productivity.

This study quantifies the impacts of South Africa's power sector on human health, and how a shift to a less carbon-intensive power sector can help to reduce negative impacts and contribute to reducing costs in South Africa's health system.

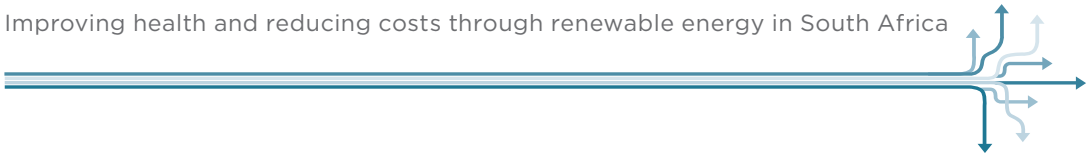
- **Key policy message 1:** Estimated health costs of coal power generation in 2018 range from R11 billion (lower estimate) up to R30 billion (upper estimate) and will continue to rise until 2022. This equates to a health cost externality of Rand 5–15 cents per kWh of energy generated from coal. As many as 2080 premature deaths annually can be attributed to air pollution from power plants in South Africa. These externalities should not be disregarded by policymakers in their integrated resource planning.
- **Key policy message 2:** South Africa can significantly cut health costs by increasing the share of renewable energy. With its decision to scale up renewables by moving from IRP 2016 to IRP 2018, South Africa by the year 2050 can cut health costs associated with the power sector by 25%, and considerably reduce negative health impacts and related costs for people and businesses.
- **Key policy message 3:** Health impacts and related costs can be reduced even further by following (or going beyond) the DEA's Rapid Decarbonisation pathway. By the year 2050, this scenario could cut an additional 20% of health costs associated with the power sector, amounting to as much as R100 billion in absolute savings.

KEY FIGURES:

- Up to 44 million people are exposed to air pollution from coal power plants in South Africa.
- Health costs related to coal emissions will peak in 2022, at up to R45 billion in that year alone.
- As many as 2080 premature deaths annually were predicted due to air pollution from power plants in South Africa.
- Health cost externalities of Eskom's power plants range from Rand 5 to 15 cents per kWh.

COBENEFITS South Africa (2019): Improving health and reducing costs through renewable energy in South Africa. Assessing the co-benefits of decarbonising the power sector

available on www.cobenefits.info



KEY FINDINGS:

- **Health costs of coal power generation will continue to rise until 2022**, ranging from R13 billion (lower estimate) to 45 billion (upper estimate) in 2022 alone, a trend shown by all energy generation scenarios. In 2018, Eskom generated about 215 TWh of electricity, at an estimated health cost of R11–30 billion. Accordingly, the health cost externalities of Eskom's power plants are within the range Rand 5–15 cents per kWh.
- **Health effects are most severe in the Highveld Priority Area, where most of South Africa's coal-fired power plants are located.** The proximity of settlements to a power plant is a major factor in total health costs, and therefore considering the locations of plants when formulating decommissioning strategies could drastically reduce human exposure to pollution.
- **Health costs can be reduced significantly by increasing the share of renewables.** By scaling up renewables in IRP 2018 in comparison to IRP 2016, South Africa by the year 2050 will cut health costs from the power sector by 25%. In absolute terms, up to R12.7 billion (upper estimate) and at least R3.8 billion (lower estimate) will be unburdened from health costs by the year 2035. For the year 2050, the estimated health cost savings are between R168 billion and R48 billion respectively.
- **By following the DEA's Rapid Decarbonisation pathway an additional 10% of health costs** (compared with IRP 2018) **associated with the power sector can be cut by the year 2035. By the year 2050, these additional cost savings would amount to almost 20%.** In monetary terms, this represents **additional savings** (compared with IRP 2018) of **at least R14 billion** (lower estimate) and up to R50 billion (upper estimate) by the year 2030, and between R28 billion and R101 billion by the year 2050. Given that this pathway included coal power generation beyond 2050, health costs could be further reduced in a scenario that phases out coal power before 2050.
- **Decommissioning of Eskom's oldest and dirtiest coal-fired power plants in the 2020s** will contribute to bringing down health costs in the nearer future to around R5–18 billion by 2030 (compared to peak costs ranging from R13 to 45 billion in 2022).
- **Health impacts on workforce productivity: The study findings show that** (independent of the choice of dispersion model) **around 27% of health costs are associated with restricted activity days.** Most studies do not model mercury – however, mercury damage accounted for up to 5% of health costs in the present study. This means that health impact assessments are highly sensitive to the estimated cost of mercury damage and to the value of a statistical life (VSL) employed.

5-step/5-scenario approach for evaluating health co-benefits

The approach taken comprises five broad steps (cf. figure below): (1) Evaluate air pollution emissions for a range of energy-generation scenarios; (2) Model the dispersion of air pollutants in the atmosphere; (3) Calculate the proportion of the population exposed to different concentrations of air pollutants; (4) Estimate the change in disease incidence associated with pollution exposure; (5) Attribute monetary costs to different diseases, thereby calculating the total financial cost of health impacts in each scenario.

Four different scenarios for the future development of the electricity sector in South Africa were analysed: the Integrated Resource Plan 2016 (IRP 2016), which is used as the baseline case; the Integrated Resource Plan 2018 (IRP 2018); Council for Scientific and Industrial Research Least cost planning scenario (CSIR_LC); and the Department of Environmental Affairs Rapid Decarbonisation scenario (DEA_RD).

Given the challenges in modelling the dispersion of pollutants over the South African territory, this study took a comparative approach based on two recent models, representing the possible lower and upper estimates of atmospheric pollutant concentrations in South Africa, thereby providing the big picture of possible effects.