OXFORD ECONOMICS

CASE STUDY

Eskom Just Energy Transition Project

SOUTH AFRICA

1. PROJECT HIGHLIGHTS

Key Cross-Country Benefit	Key National Benefit
Sustainably reducing GHG emissions through South Africa's first coal plant decommissioning and repurposing of the site with renewables.	***Addressing energy poverty and creating job opportunities by investing in renewable energy production.***

2. QUICK FACTS

Categories	Project Details
Project Name	Eskom Just Energy Transition Project
Project Description	The project aims at reducing GHG emissions and addressing energy poverty by decommissioning all nine units of South Africa's coal-fired power plant called Komati. The area will be repurposed with renewables. As the transformation will have employment effects, the project is complemented by a "just transition" component creating opportunities for workers and communities during the transition process.
Global Public Good (GPG) Theme	Climate & environment
Sub-Theme	Climate change mitigation

Disclaimer: We based the case study on the information cited and publicly available as of May 2023. The findings – especially concerning the GPG perspective – have been concluded to our best knowledge. The views expressed are the authors' assessments and do not necessarily reflect the project stakeholders' views. Any errors that remain are our responsibility.

Sector	Energy
Country of Implementation	South Africa
Region	Sub-Saharan Africa
Income Category	Upper-middle-income economy
Implementation Period	2022-2028
Project Volume	US$497.00 million
Financial Source	**International Bank for Reconstruction and Development (IBRD)**: US$439.50 million (loan); **Canada Clean Energy and Forest Climate Facility Trust Fund**: US$ 47.50 million (highly concessional loan); **Energy Sector Management Assistance Program**: US$ 10.00 million (grant)
Instruments	Investment Project Financing
MDB Involved	World Bank
Implementing Partner	Eskom Holdings Soc Ltd
Link to Detailed Project Information[1]	https://documents1.worldbank.org/curated/en/099020010142264205/pdf/BOSIB0f5b6808c0b60b1450bb0410da44c7.pdf

3. WHY THIS IS A GOOD PRACTICE

This project is a good practice example for implementing the following features that promote GPG provision:

- **Ambition:** The project is the first decommissioning and repurposing project in South Africa. It is highly ambitious as it is supposed to make the case for one of the most tangible, impactful, and urgently needed actions for climate change mitigation—coal plant decommissioning.
- **Sustainability:** The project is sustainable in different ways. Institutional sustainability is ensured by capacity-building activities within Eskom as well as the creation of a dedicated unit for coal plant retirement. The climate and environmental benefits are long-term as the share of renewables is increased

[1] Unless otherwise stated, the information used in this case study can be found in this source.

and the plant is demolished so it cannot be reused again. The third component ensures a just transition contributing to the project's social sustainability.

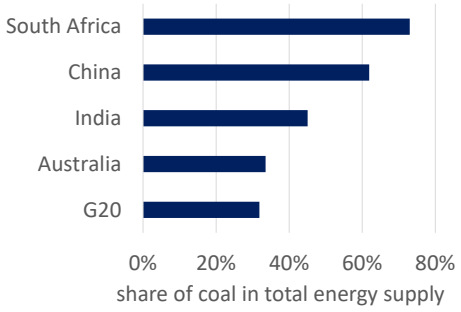
- **Scalability:** The project is scalable to other coal plants of Eskom that have to be decommissioned and repurposed in the next years. The technical experiences gained in the Komati project as well as the establishment of platforms and mechanisms to ease the socio-economic transformation process can also have economies of scale for Eskom.
- **Transformability:** The need for a just transition component alone illustrates the project's highly transformative character. Moreover, the grid emissions of South Africa's power generation will sustainably change. Since Komati is a pilot for the country's coal exit, the project also is a signal that South Africa has embarked on its low-carbon transformation path.

4. PROJECT INFORMATION

4.1 CHALLENGES OF GPG PROVISION IN THE COUNTRY CONTEXT

In 2019, South Africa emitted 1.2% of global GHG emissions and its carbon intensity was almost six times higher than the OECD average.[2] The **high carbon and energy intensity of the South African economy is mainly due to its heavy reliance on coal**. Among the G20, South Africa is the most coal-dependent country (see Figure 1). Consequently, the energy sector accounts for 45% of the country's emissions as well as 12% of upstream emissions.[3]

FIGURE 1: ABOVE AVERAGE COAL-DEPENDENT G20 COUNTRIES (2019)



Source: IEA

South Africa updated its National Determined Contribution (NDC) in 2021 that commits it to a maximum of 350–420 $MtCO_2e$ in 2030. Furthermore, the vision of a net zero transformation by 2050 is envisaged.[4] To reach this goal, calculations from the South African TIMES Energy Model show that the **electricity produced by coal needs to be reduced drastically** —mainly in the 2020s to 2030s (see Figure 2). This is only possible if the power mix changes considerably. As stated in the Integrated Resource Plan 2019 (IRP 2019), 10-12 gigawatts (GW) of the old and inefficient coal power plants need to be decommissioned by 2030 and replaced by around 18 GW of renewables. To account for the continuously growing energy demand.[5] In 2021,

[2] World Bank (2022a): https://openknowledge.worldbank.org/server/api/core/bitstreams/52409ffd-96f7-58d4-be7f-c8114abbd4c5/content

[3] World Bank (2022a): https://openknowledge.worldbank.org/server/api/core/bitstreams/52409ffd-96f7-58d4-be7f-c8114abbd4c5/content

[4] Climate Action Tracker 2022: https://climateactiontracker.org/countries/south-africa/#:~:text=We%20rate%20South%20Africa's%202030,1.5%C2%B0C%20temperature%20limit.

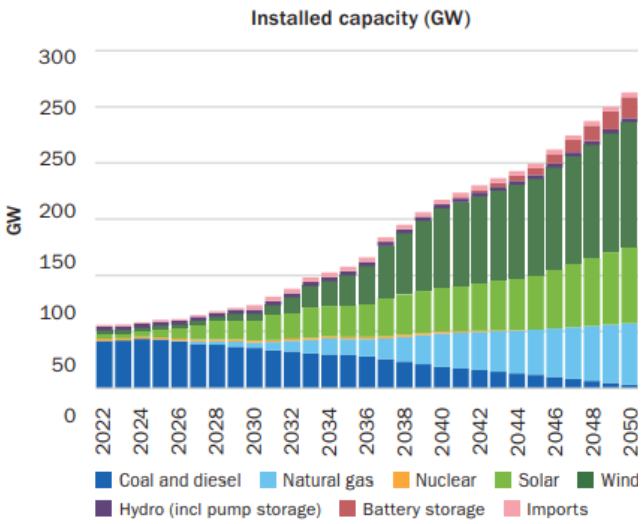
[5] World Bank (2022a): https://openknowledge.worldbank.org/server/api/core/bitstreams/52409ffd-96f7-58d4-be7f-c8114abbd4c5/content

only 15% of the installed capacity was produced by renewables. This has to change considerably by 2050 as Figure 2 shows.[6]

The state-owned Eskom plays a central role in this coal phase-out. **Eskom alone is responsible for more than 40 % of South Africa's emissions.** This is mainly because of Eskom's 15 coal-fired plants that provide 74% of South Africa's installed capacity. Although Eskom has committed to also reach net zero by 2050, Eskom's progress in decarbonising has been slow. Moreover, experiences from other countries with high dependencies on coal show that an energy transition takes decades. Thus, there is an urgent need to start the net-zero pathway and put plans into action.

At the same time, South Africa has to deal with chronic power shortages due to frequent load shedding. Estimations show a current supply gap on-grid between 4 and 6 GW that negatively impacts macroeconomic development. Therefore, the government has initiated several measures to increase the generation capacity including a **generation improvement plan for Eskom that involves large investments in maintaining and renewing its energy infrastructure**. Unfortunately, Eskom's financial situation is fragile. The company has not made net profits for several years. Operating losses and unsustainable debt burden adversely affect its solvency. Although cash flow projections show an improvement in Eskom's financial situation, Eskom will still rely on the government's financial support—especially in light of the high investment needs ahead.

FIGURE 2: POWER SECTOR GENERATION AND INSTALLED CAPACITY BY TECHNOLOGY FOR THE NET ZERO SCENARIO



Source: World Bank (2022), Figure 6

4.2 INTERVENTION

4.2.1 Project Design and Agents of Change

The Government of South Africa has chosen the Komati coal-fired power plant as a pilot for its decommissioning and repurposing plans. Komati is located in the Mpumalanga Province and has nine units in total with a total installed capacity of 1,000 MW. The plant has been off and on in the past years. In 2021, only unit 9 was operating, while units 1 to 8 were "put in cold reserve" as they would need high investments to reuse

[6] World Bank (2022b): https://documents1.worldbank.org/curated/en/099020010142264205/pdf/BOSIB0f5b6808c0b60b1450bb0410da44c7.pdf

them. Komati as a whole has reached its end-of-technical life in October 2022. However, Eskom considered expanding the life of the plant to 2026 given the electricity supply gap in South Africa.

This is where the **World Bank project** comes into play. A comprehensive cost-benefit analysis was conducted for several project alternatives of project design. As a result, **namely decommissioning the Komati plant and repurpose the site with renewables,** has been selected by the stakeholders. Eskom serves as the implementing agency.

FIGURE 3: VIEW OF KOMATI POWER STATION

Source: Eskom (2023)

The Eskom Just Energy Transition Project is the first decommissioning and repurposing project financed by the World Bank globally and the first in South Africa. The project is based on **three broad components** that jointly contribute to the high-level objectives of climate change mitigation, energy security, and economic opportunities:

1) **Decommissioning:** The first component aims to mitigate climate change by decommissioning the Komati plant. The decommissioning includes the process of shutting down Komati, disconnecting it from the system, demolition and blasting, as well as site rehabilitation. The target attainment is measured in avoiding GHG emissions. In total, conservative estimates conclude that 317 $ktCO_2e$ between 2023 and 2026 will be avoided by shutting down Komati in October 2022.[7]
2) **Repurposing:** The second component is repurposing the area with hybrid renewables and batteries to ensure energy security. This includes repowering the site with solar photovoltaic, batteries, and wind, adopting innovative technical solutions to improve the quality of power supply (i.e., conversion of generator units to synchronous condensers which will absorb and produce reactive power to stabilise and strengthen the power system); and implementing demonstration projects for potential scale up in communities in the local Komati area and municipality to create employment opportunities (e.g., Agri-voltaic Plant, Microgrid Assembly and Manufacturing Facility, Komati Training Facility). In total, the repurposing will produce 492 GWh of green energy annually.
3) **Opportunities for workers & communities:** The socio-economic impacts of the plant closure are supposed to be minimised by creating opportunities for workers and communities during the transition process. This includes transition support for Komati permanent workers, suppliers, and contract workers, community development and economic diversification for the local communities and those with indirect connections to the power plant (e.g. piloting/scaling-up of innovative initiatives, investments in commercially viable local area development activities, reskilling and upskilling of community members), as well as stakeholder engagement and community empowerment via various engagement platforms and mechanisms. It is expected that all Eskom workers are either retrained, re-employed, or compensated. Moreover, 40 suppliers, contractors, and enterprises will have been supported by the

[7] If the emissions would stay constant and not improve slightly due to the assumption that the emission factor would improve after investing in unit 9 for expanding its life expectancy, the avoided CO_2 emissions sum up to 3,388 $ktCO_2e$ avoided between 2023 and 2026.

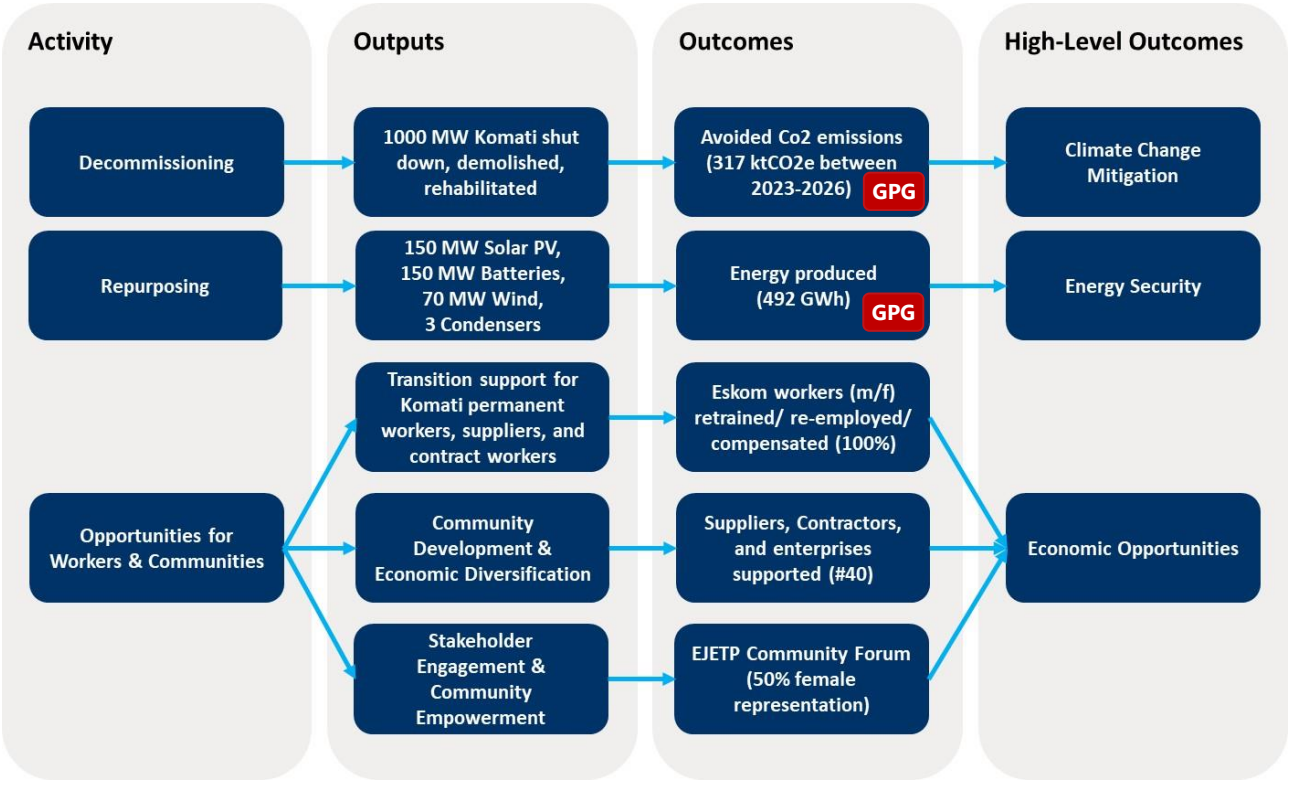
end of the project and the project's Community Forum is established with at least 50% of female representation.

The project costs sum up to US$497 million. The repurposing has the highest cost share with total costs of US$416 million. The costs for the "just transition component" sum up to US$47.5 million and the costs for the decommissioning itself are the lowest at US$33.5 million. **Three different sources of financing account** for the total project costs of this investment financing project. US$439.50 million are covered by an IBRD loan plus US$47,50 million contributed by a highly concessional loan provided by the Canada Clean Energy and Forest Climate Facility Trust Fund. Additionally, the Energy Sector Management Assistance Program support the project with a grant of US$10 million. Eskom contributes the 687 ha land required under the project.

4.2.2 Results

Figure 4 illustrates the components, activities, outcomes, and high-level objectives described above. The two outcomes specifically addressing GPG effects are highlighted.

FIGURE 4: RESULTS FRAMEWORK FOR THE PROJECT



Note: GPG highlights indicators that are particularly relevant from the GPG perspective.
Source: World Bank (2022), Figure 1

The project was approved by the WB Board of Directors on November 03, 2022. The project Financing Agreements (FAs) are expected to become effective by September 2023. Procurement related to project priority activities is ongoing including the hiring of an Owner's Engineer (OE) for the repurposing and decommissioning of the Komati coal plant. As of April 2023, the planning of the decommissioning is ongoing. The plant has

been already disconnected from the grid and Eskom with the support of OEs are planning the demolition of towers and stacks and clean-up of the site. So far, the **progress has been satisfactory**.[8]

5. PROJECT IMPACT

5.1 NATIONAL BENEFITS

South Africa benefits in several ways from the Eskom Just Energy Transition Project:

- Investments in renewables and complementary technologies like storage and natural gas will create **new job opportunities**. It is conservatively estimated that for each job lost or retained in the project, 2.4 new jobs will be created.[9]
- The project tackles the problem of **energy security** in South Africa by investing in a sustainable, fast-to-implement and least-cost energy source—i.e., renewables. Higher energy security, the avoidance of ongoing blackouts, and an overall more resilient energy power sector will have positive effects on productivity and economic growth.
- Given that clean energy technologies are the cheapest power generation options in South Africa, the project is expected to **lower the cost of generating electricity** in Komati. This will help to improve Eskom's financial situation and reduce the need for governmental financial support to this state-owned company.
- Reducing South Africa's very high carbon intensity will have positive effects on South Africa's **competitiveness in global markets**. As consumers demand more energy-friendly products and governments are imposing import restrictions for carbon-intensive products, carbon-neutral production will have high benefits to the South African economy. It is projected that **about half of South Africa's exports are at high risk of being penalised by the Carbon Border Adjustment Mechanism** that the European Union will introduce.[10]
- **Reducing local pollutants in air, soil, and water streams** by decommissioning Komati, particularly in the Mpumalanga and Gauteng areas, will produce high health benefits. From April 2020 to March 2021, Komati emitted 5,178 tons of nitrogen dioxide (NO_2), 189 tons of particulate matter, and 7,712 tons of sulphur dioxide (SO_2). Air pollution alone is estimated to cause the premature deaths of over 20,000 South Africans every year.[11]
- Furthermore, the dismantling, demolition, and removal of several buildings, structures, and dams, as well as the rehabilitation and clean-up of contaminated areas and removal of hazardous waste will

[8] World Bank (2023): https://documents1.worldbank.org/curated/en/099073002152326220/pdf/P177398061ed4407509f7d08138931ba0fa.pdf

[9] World Bank (2022a): https://openknowledge.worldbank.org/server/api/core/bitstreams/52409ffd-96f7-58d4-be7f-c8114abbd4c5/content

[10] World Bank (2022a): https://openknowledge.worldbank.org/server/api/core/bitstreams/52409ffd-96f7-58d4-be7f-c8114abbd4c5/content

[11] World Bank (2022a): https://openknowledge.worldbank.org/server/api/core/bitstreams/52409ffd-96f7-58d4-be7f-c8114abbd4c5/content

contribute to **improving surface and groundwater quality**, which in turn will have positive impacts on food security and the sustainability of ecosystems.

5.2 CROSS-COUNTRY BENEFITS

317 $ktCO_2e$
are expected to be avoided by this project. This equals the 2021 per capita CO_2e consumption of over 42,000 persons in South Africa

The project does not only produce benefits to South Africa but has large positive cross-country externalities as well. **The reduced GHG emissions of 317 kt CO_2e**[12] might benefit South Africa partly, but most of the benefits accrue to all countries worldwide. If the climate impact of the renewable energy installation is added to these climate effects and the benefits are valued at US$307 per tCO_2e, the climate change mitigation benefits by the project sum up to US$1,688 million. In the cost-benefit analysis of the project, the present value of the avoided emissions ranges between US$13 million and US$25 million, depending on whether the high or the low scenario of the World Bank's shadow carbon price is used.[13]

Not accounted for in this analysis is that the repurposing of the site with renewables also has positive effects on South Africa's overall grid emissions factor. 492 GWh of clean energy is produced yearly. This will **increase the renewables share in installed capacity for South Africa almost by 1%.** Moreover, some part of the ecosystem benefits caused by reducing water and soil contamination will also be cross-country externalities.

6. LESSONS FOR FUTURE GPG PROVISION

6.1 SUCCESS FACTORS

According to South Africa's President Ramaphosa, the "**Komati pilot will serve as a good example of how the shift from coal dependency could be achieved**".[14] Hence, the success of the project is crucial for South Africa's future coal exit strategy. The expected success of the project is caused by the following characteristics.

First, the **comprehensive cost-benefit analysis as well as the financial analysis of the project had an important part in convincing all stakeholders** to agree to Komati's decommission and repurposing. It showed that for all components the benefits outweigh the costs—even though many benefits have not been considered in monetary terms (e.g., air, water, soil benefits). The financial cash-flow analysis ensured that Eskom could stem the project which is of utmost importance given its precarious financial situation.

[12] For comparison, the saved emissions have been divided by the 2019 per capita Carbon dioxide (CO_2) emissions from fossil fuels and industry in South Africa. See World in Data (2023): https://ourworldindata.org/co2/country/south-africa

[13] World Bank (2022b): https://documents1.worldbank.org/curated/en/099020010142264205/pdf/BOSIB0f5b6808c0b60b1450bb0410da44c7.pdf

[14] World Bank (2022b): https://documents1.worldbank.org/curated/en/099020010142264205/pdf/BOSIB0f5b6808c0b60b1450bb0410da44c7.pdf

> *"Komati pilot will serve as a good example of how the shift from coal dependency could be achieved." — President Ramaphosa*

Second, **combining all three components in one integrated and holistic project design will contribute to success**. The project profits in particular from the component managing the social and labour impacts of the coal plant closure. Given the project affects jobs directly and indirectly the project would not have been possible without a strong just transition component. This is emphasised as coal suppliers are typically "Black-owned"[15] companies. As the so-called Black Economic Empowerment is an explicit goal of the South African government targeted at increasing the economic participation of black people, the fact that they are hit disproportionally hard by the coal plant closure adds a considerable political dimension.[16] This is reflected in the Just Transition Framework of South Africa which the project's just transition component relates to. The framework builds on three guiding principles. Distributive justice addresses an equitable distribution of risks and responsibilities resulting from the direct impacts of the transition. Restorative justice focuses on historic responsibilities aiming at rectifying and ameliorating the situations of harmed people and communities. Procedural justice concentrates on empowering workers, communities, and small businesses and incorporating their goals and definitions into government actions.

Third, while the overall net present value of the project is huge if GHG emissions are valued, the national profit of the project would have been negative as the benefits valued at US$306 million are lower than the total project costs of US$497 million. Even considering the benefits of the World Bank's AAA rating, the net profit would remain negative. Thus, **the highly concessional loan from the Canada Clean Energy and Forest Climate Facility Trust Fund and the grant provided by the Energy Sector Management Assistance Program the that were available from the beginning helped in convincing Eskom and the South African government to raise a loan for this project**.

Another key success factor was that the World Bank has engaged in **strategic dialogue with both the National Treasury and its supervisory department, and Eskom's senior leadership**. In general, there is the need for a strategic and institutional dialogue at the senior level making sure that all main stakeholders are aligned when designing complex project.

6.2 HOW TO REPLICATE THE GOOD PRACTICE

The project **can be replicated in other coal plant retirements—especially concerning technical expertise and the options to mitigate socio-economic impacts**. Eskom already prepares pre-feasibility studies for the retirement of additional power plants based on the experiences made at Komati. Additionally, an adaptive learning approach including the documentation and dissemination of approaches, tools, and lessons learned from the Komati experience will inform the future closure of coal-fired power plants and just transition processes.

[15] This term refers to a statistical unit in South Africa that is used to obtain granular data on the composition of the business landscape and to target political initiatives accordingly (Broad-Based Black Economic Empowerment Amendment Act, 2013).

[16] Department of Trade, Industry and Competition Republic of South Africa (2014): http://www.thedtic.gov.za/financial-and-non-financial-support/b-bbee/broad-based-black-economic-empowerment/

In addition to that, the following lessons can be learnt from the project:

- The World Bank's convening power ensured the inclusion of all relevant stakeholders (public and private) during project preparation and implementation. Bringing all parties to the table took the World Bank more than a year but discussing all available options and proposing the least cost option has eventually made this ambitious project possible.
- The result of the **cost-benefit analysis** was very sensitive to the value of CO_2 emissions. Besides emission costs, the items with the most significant impacts over comparative results are capex including direct decommissioning costs and pre-tax salaries of affected employees.
- The (financial) feasibility of a coal plant decommissioning depends on the age of the coal fleet to be decommissioned, whether the decommissioning includes a very costly coal mine closure, and the magnitude of the just transition component. The higher the real costs for decommissioning or the opportunity costs for the pre-life expectancy closure, the larger the financial incentives need to be. Then again, these projects might entail even larger climate and environmental benefits.
- The institutional setup to bring the private sector into financing the renewables could be also designed differently. A public-private partnership (PPP) structure for repurposing coal plants should be considered and is in fact what Eskom plans for the future.
- A lot of technical expertise is needed to decommission and repurpose a coal plant. Experienced consultants and World Bank staff have been indispensable to designing the project.
- Defining the project boundaries is very complex. On the one hand, the just transition component has to be holistic and will be defined in dialogue and communication with stakeholders. Furthermore, it increases the national benefits of a project. On the other hand, the expectations and size of this component need to be managed and checked constantly as the overall net present value is very sensitive to this component. Managing this challenge is best achieved when **multiple stakeholders at the municipal, provincial, and national levels as well as the private sector and civil society organisations are involved early in the project planning**. The aim is an inclusive and consensus-oriented consultation process.
- The technical and socio-economic complexity of the project limits its scalability to other countries and institutional contexts. Hence, the transition of the energy sector to renewables requires tailor-made solutions for each country.