national treasury
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MEDIA STATEMENT

PUBLICATION OF THE CARBON TAX MODELLING REPORT

The National Treasury today publishes a carbon tax modelling report entitled: **"Modelling the Impact on South Africa's Economy of Introducing a Carbon Tax".** This report provides an assessment of the impacts of the proposed carbon tax policy on reducing greenhouse gases (GHG) emissions, economic growth, employment, and industry competitiveness. The study was conducted on behalf of the National Treasury under the Partnership for Market Readiness initiative administered by the World Bank, which is aimed at supporting countries in strengthening their policy analysis and technical capacity to implement carbon pricing measures.

This study closely models the design features of the tax as outlined in the 2013 Carbon Tax Policy Paper. The design of the carbon tax aims to contribute to a meaningful and permanent reduction in greenhouse emissions whilst, at the same time, to minimise any potential adverse impacts on low income households and industrial competitiveness. The provision of tax-free emissions thresholds and allowances ranging from 60 per cent to 95 per cent will result in a relatively modest carbon tax rate ranging from R6 to R48/tonCO_{2eq} during the first phase of the carbon tax up to the end of 2020.

The modelling results suggests that the carbon tax will have a significant impact on reducing South Africa's GHG emissions and would lead to an estimated decrease in emissions of 13 to 14.5 per cent by 2025 and 26 to 33 per cent by 2035 compared with business-as-usual. The carbon tax would make an important contribution towards reaching South Africa's Nationally Determined Contribution (NDC) commitments under the recently ratified Paris Agreement for emissions to peak in 2020 to 2025, plateau for a ten year period from 2025 to 2035 and decline thereafter.

The carbon tax will also ensure that emissions reductions are delivered while sustained economic growth is realised. The carbon tax is expected to lead to a reduction in the annual average growth rate of the economy of just 0.05 to 0.15 percentage points compared to business-as-usual. Sensitivity analysis shows that the carbon tax would have a similar modest impact even if the economy grows less quickly than expected.

Model overview and assumptions

The study uses the University of Pretoria's General Equilibrium Model (UPGEM) which is a dynamic general equilibrium model of the South African economy. The model provides a

quantitative description of the South African economy, and accounts for linkages and interactions between the various sectors and agents within the economy.The model was modified to allow for detailed analysis of the impacts of the carbon tax on the electricity generation mix and GHG emissions.

The analysis relies on a comparison between a baseline scenario and different policy scenarios informed by the tax design. The baseline scenario specifies how the economy is expected to evolve over time without the introduction of the tax or any other regulatory interventions. This is then compared to the expected change in the economy when a specific carbon tax design and revenue recycling measure is introduced. The difference between the baseline and various policy scenarios provides an assessment of the impact of the policy intervention on the economy.

Two baseline scenarios were considered in this study that is, a main and alternative baseline. The main assumptions for both scenarios are summarised below.

- **Main baseline scenario:** assumed average annual GDP growth of 3,5 per cent from 2016 to 2035, constant inflation of 5,5 per cent and population growth of 1 per cent.
- **Alternative baseline scenario**: assumed average annual GDP growth of 2,4 per cent from 2018-2035 .
- **Efficiency improvements and technology:** No explicit assumptions were made regarding future improvements in efficiency and cost competitiveness of clean technologies relative to fossil fuel based sources in the electricity generation mix. The ratio of each electricity generation technology relative to total electricity generation remains fixed in the baseline relative to 2014 values, to more accurately isolate and measure the impact of the carbon tax.

Scenarios modelled

The modelling analysis considers four different tax designs (T) in combination with five possible recycling schemes (R). The main difference in the tax policy scenarios is the inclusion of the agriculture and waste sector and adjustments in the level of the tax free allowances post 2020.

The revenue recycling scenarios comprise broad, production based recycling, broad or selective reductions in the VAT rate and targeted support for the renewable energy sector. For the revenue recycling scenarios, it is assumed that the revenues from the carbon tax are recycled such that the government deficit remains unchanged, that is the revenues are rechannelled into the economy.

Table 1: Tax policy and revenue recycling scenarios

TAX POLICY SCENARIOS		REVENUE RECYCLING SCENARIOS	
T1	• Basic allowance of 60 per cent • Tax rate of R120/tonCO_{2e} • Increase of tax rate by 10%/annum from 2016 to 2020 and by the assumed rate of inflation of 5,5% from 2021 onwards • Agriculture and waste sector emissions are exempt over the entire period • Tax free thresholds constant from 2016 to 2035	**R1**	**Output-based rebate on all production** across all sectors.

T2	The carbon tax is applied as in T1 but**:** • Tax free allowances for industries removed at the rate of 10 percentage points / annum from 2021 onwards	**R2**	**Decrease in the VAT rate** on all goods consumed by households.
T3	The carbon tax is applied as in T1 but: • Agriculture and waste sector emissions allowances removed at the rate of 10 percentage points/annum from 2026	**R3**	**Combination of R1 and R2 (split 50:50)**: • Output-based rebate on all production across all sectors. • Decrease in the VAT rate on all goods consumed by households
T4	This is a combination of T2 and T3: • Tax free allowances are removed at the rate of 10 percentage points/annum starting in 2021 for all industries except for agriculture and waste sector for whom allowances are removed at the rate of 10 percentage points/annum from 2026	**R4**	**Subsidising the production of renewable electricity generation**: • subsidy for solar PV
		R5	**Decrease in VAT on 4 commodities: a**gricultural goods, food, transport and beverages and tobacco

Due to technical reasons, some of the design features of the tax, including the opportunity to use carbon offsets for some proportion of the liability, allowances for participation in the carbon budget process and the performance (z-factor) allowance could not be modelled. This might suggest that the initial impact of the carbon tax might be muted, slightly less GHG emission reductions and lower impact on economic growth.

It is important to note that any possible negative impact from climate change and unabated emissions or benefits from reducing GHG emissions as well as co-benefits such as lower levels of local air pollution has not been factored into the modelling. **Therefore, the model analysis and results is likely to underestimate the benefits of the carbon tax policy and should not be viewed as an assessment of the overall impact of introducing a carbon tax in South Africa.**

Broad findings from the report

The findings from the T2R1 scenario referred to as the 'focus' scenario are discussed below. In this scenario the tax-free allowances, as laid out in the proposed design of the tax, are gradually removed at a rate of 10 percentage points per annum for all sectors (except agriculture and waste), and revenues are recycled through a rebate to all firms proportional to their output. The other revenue recycling scenarios, including reductions in the VAT rate and 'narrow' recycling measures to a small number of sectors are not as effective at offsetting the impact of the tax on economic activity.

The simulations suggest that the introduction of a carbon tax will contribute significantly to South Africa's GHG emissions reduction goals. The analysis shows the estimated reductions of 33 per cent by 2035 compared with business as usual.

The economy will continue to grow whilst emissions are reduced. The modelling results estimate that a carbon tax will reduce the economy's average annual growth rate by only 0.15 percentage points.

The carbon tax also has a small impact on other macroeconomic aggregates such as employment, consumption and real wages. In the 'focus scenario', the annual growth rate in household consumption falls by 0.23 percentage points, employment falls by 0.07 percentage points, and real wages fall by 0.2 percentage points.

Simulation results suggests that concerns over the competitiveness impacts of the carbon tax are overstated as exports could be 3.5 per cent higher in 2035 with the introduction of the carbon tax. This is driven by sectors such as transport equipment, electrical machinery, and textiles and footwear sectors which are expected to experience increases in the annual growth rate of exports of around 7 per cent as a result of the carbon tax plus revenue recycling. In 2035, their exports are likely to be around 30 to 40 per cent higher than in the baseline.

However, certain sectors are projected to experience declines in exports including the coke oven and iron and steel sectors, although in the latter case the sector's exports continue to grow over the period to 2035, just at a lower rate than if there were no carbon tax.

There will be a number of important sectoral winners and losers from the carbon tax and these are consistent with the objective of the carbon tax of promoting structural change. In 2035, the output from the nuclear, wind, hydro, gas and solar photovoltaic (PV) power generation sectors is expected to be more than 200 per cent greater than without a carbon tax. These low carbon sources of power will become much more cost-competitive with a carbon tax. Coal generation becomes less cost competitive with its output expected to be 46 per cent lower in 2035 than it would be without the tax. Other sectors that could experience a decline in output relative to the baseline include petroleum refining, other manufacturing, coke production and the electricity supply sector. However, it should be stressed that this is a *relative* decline in output compared with the situation in which there is no carbon tax. All of these sectors are projected to grow in absolute terms by between 18 (coal generation) and 105 (other manufacturing) per cent over the period 2014 to 2035 even with a carbon tax.

The method of revenue recycling was found to be an important driver of the results. The analysis shows that a carbon tax with persistent tax-free allowances will yield substantially lower emissions reductions, but also have a smaller negative impact on GDP growth. The analysis suggests that broad, production based recycling such as the producer focused rebates is likely to yield smaller impacts on GDP but also less significant emissions reductions, whilst a narrow, clean energy focused support will lead to substantial decreases in emissions but a lower growth rate for the economy. The current design of the carbon tax include elements of broad based (electricity generation levy credit) and targeted support measures for low income households.

The common key finding of all the modelling studies conducted to date on the carbon tax is that the introduction of a carbon tax will contribute significantly to SA's GHG emissions reduction goals and will only have a modest negative impact on economic growth and other macroeconomic aggregates such as employment, consumption and real wages over the medium term.

The ratification of the 2015 Paris Agreement emphasises the reality that we will have to prepare to operate in a carbon constrained economy over the medium to long term. A business as usual scenario is no longer an option and we must take appropriate and proactive actions

to help transition our economy onto a low carbon growth path as articulated in the National Development Plan. The carbon tax, together with the carbon offsets, is an important and cost effective instrument, as part of a package of measures, to nudge our economy onto a more sustainable growth path in a just way.

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