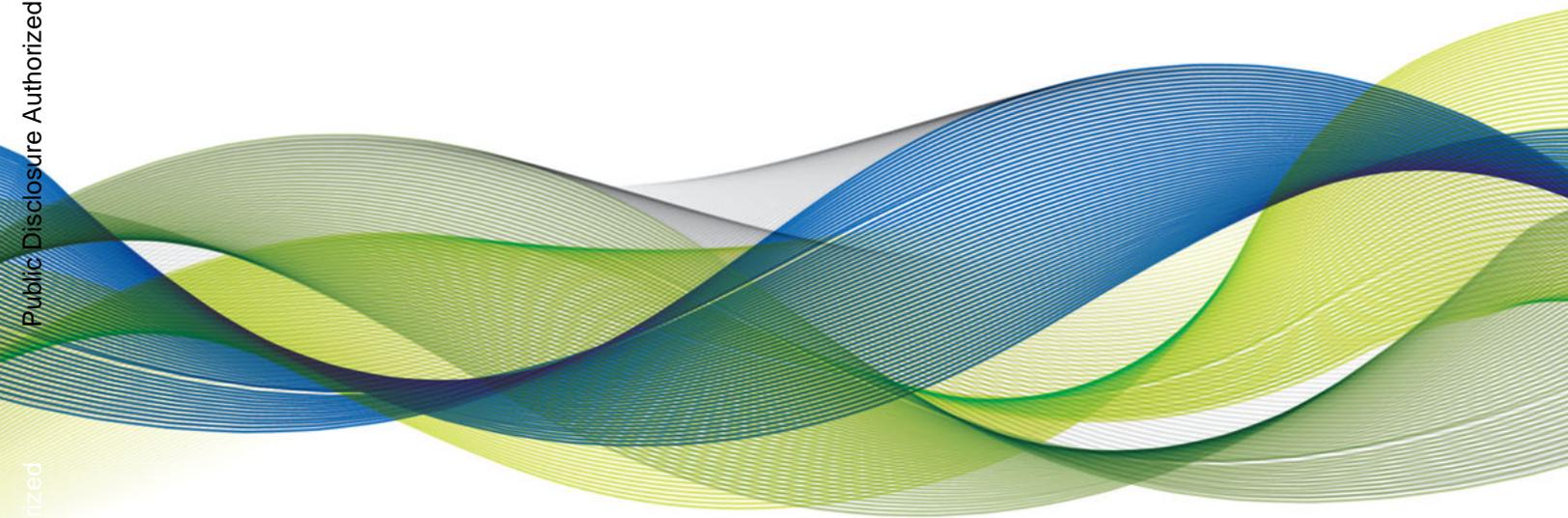




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Integration of the Carbon Tax and Carbon Budgets in South Africa



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Contents

ACKNOWLEDGMENTS	vii
EXECUTIVE SUMMARY	ix
1 INTRODUCTION	1
2 PRINCIPLES USED TO ASSESS INTERFACE OPTIONS	3
2.1 Summary of principles from existing documentation	3
2.2 Synthesis and identification of principles related to policy integration	4
3 PLANNED DESIGN FEATURES OF EACH INSTRUMENT	13
3.1 Carbon tax to 2020	13
3.2 Carbon budgets to 2020	14
3.3 Assumed 'departure point' for 2021 and beyond	16
4 PROPERTIES OF BUDGETS AND TAXES AND INSIGHTS ON INTEGRATION	17
4.1 Advantages and disadvantages of the carbon tax and carbon budget	17
4.2 Insights from international practice in combining mitigation policy instruments	22
5 INTERFACE OPTIONS	25
6 OPTION ASSESSMENT	29
6.1 Layering	30
6.2 Tax used to enforce the budget	34
6.3 Hybrid instruments with trading	39
6.4 Differentiated instruments	48
6.5 Scoring overview	52
7 CONCLUSIONS	63
7.1 Recommended approach to interface for implementation in short term (immediately post-2020)	63

7.2 Recommended longer term for the interface (2025 onwards)	65
7.3 Treatment of the electricity sector	65
References	69
Annex A International experience.	71
Annex B National documents	81

List of Tables

Table 1. Full list of principles used to assess interface options.	6
Table 2. A comparison of the strengths and weaknesses of carbon taxes and carbon budgets.	21
Table 3. Layering sacrifices cost-effectiveness to achieve higher emissions reduction effectiveness.	31
Table 4. Budget with tax on emissions in excess of budget.	36
Table 5. Budget with tax on all emissions if budget is exceeded scores particularly poorly on cost-effectiveness	38
Table 6. ETS with price floor and/or ceiling scores well on emissions reduction effectiveness, certainty, and cost-effectiveness but generates potentially less revenue than other interface options to increase fairness and equity	41
Table 7. Absolute emissions baseline and credit achieves a similar score to an emissions trading system	45
Table 8. Emissions intensity baseline and credit scores lower than ETS and absolute baseline and credit by restricting emissions trading to within-sector instead of allowing economy-wide trading.	47
Table 9. There is no clearly superior interface instrument; trade-offs across different principles need to be made	53
Table 10. ETS and layering outperform other interface options on emissions reduction effectiveness.	54
Table 11. Interface options which place greater emphasis on budgets provide greater emissions certainty.	55
Table 12. Trading minimises costs whereas a strict enforcement of a budget creates potentially very high costs	56
Table 13. All interface options internalise external cost.	57
Table 14. No option scores well on equitable treatment.	58

Table 15. Interface options that generate government revenue and/or that can target emissions reduction efforts in certain sectors tend to score better	59
Table 16. Interface options merging current processes without adding requirements perform well	60
Table 17. Hybrid options and the budget with tax on emissions above budget can be flexible and limit competitiveness impacts whereas layering is the most rigid option creating potentially high costs and impacts on sectors in international competition	61
Table 18. France’s nonbinding sectoral carbon budgets	75

List of Figures

Figure 1. Fifteen principles grouped into three categories	5
Figure 2. Budgets and taxes fall into different instrument categories and target emissions quantity and price, respectively	18
Figure 3. Market-based instruments have significantly lower cost than regulatory, command and control instruments	19
Figure 4. Four main interface options	25
Figure 5. South Africa currently has a model similar to the UK CCA and CCL arrangement	72
Figure 6. Three categories of national documents have been considered	81

List of Boxes

Box 1. Differences between an ETS and an absolute baseline and credit scheme	27
Box 2. Options to facilitate trading given emissions concentration in the South African economy.	40
Box 3. Incentivising abatement from reducing electricity consumption in the Republic of Korea	52
Box 4. National Development Plan	82
Box 5. National Climate Change Response White Paper.	83
Box 6. Carbon Budget Design Document	85
Box 7. Carbon Tax Options Discussion Paper	86
Box 8. Environmental Fiscal Reform Paper.	87

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¹ Nothing in the report should be taken as representing the views or policy position of either the Department of Environmental Affairs or the National Treasury of South Africa.

Executive Summary

In 2009, at the UNFCCC Conference of the Parties (COP) in Copenhagen, South Africa made a voluntary commitment to reduce its greenhouse gas (GHG) emissions by 34 percent in 2020 and 42 percent in 2025 relative to business-as-usual (BAU). This was part of a wider commitment by South Africa to contribute to the global effort in mitigating anthropogenic climate change and to transition to a lower-carbon economy. This was reaffirmed in its Intended Nationally Determined Contribution (INDC) submission to the UNFCCC, in advance of COP 21 in Paris in 2015, which identifies the intention that South African emissions should follow a 'Peak Plateau and Decline' (PPD) trajectory: peaking in 2025 within a range of 398 to 614 MtCO_{2e}; plateauing for approximately a decade; before beginning to decline in absolute terms, falling to between 212 to 428 MtCO_{2e} by 2050.

Among a suite of different policies, two, in particular, have been designed with the intention of delivering a significant proportion of these emission reductions:

- A carbon tax designed by the National Treasury (NT) to provide a price signal to producers and consumers of carbon-intensive products and to create an incentive to invest in cleaner technology. The carbon tax is expected to come into operation in 2017 at a headline rate of R120/tCO_{2e}, although the effective tax rate will initially be lower as a result of a series of tax free allowances.
- A series of carbon budgets designed by the Department of Environmental Affairs (DEA) envisaged to provide a GHG emissions allowance (in other words, a cap), against which physical emissions arising from the operations of a company during a defined time period will be tracked. In the period to 2020, the carbon budgets will not be a compliance instrument but rather will be used to increase understanding of the emissions profile of participating companies, and to establish monitoring, reporting, and verification (MRV) processes. Beyond 2020, they are intended to become compulsory.

This paper provides recommendations for combining the carbon budget with the carbon tax to support delivery of South Africa's emissions reduction targets beyond 2020. While both the carbon tax and carbon budget approach have merits, economic theory would suggest that there could be risks associated with applying both instruments to the same emissions at the same time. Stakeholder consultation also revealed significant concerns with this option. There is therefore a desire to understand how they may be aligned to ensure that South Africa's mitigation policy is placed on a coherent footing on the longer term. Although they could be considered as mutually exclusive options, the terms of reference for this study have specifically requested that possible interfaces between these two instruments or approaches be considered, and hence the possibility of just proceeding with one or other of the options is not explored in this report.

The analysis involves comparing four categories of policy alignment options across eight core principles. The four categories of alignment options, developed by the consultancy team and agreed in consultation with DEA and NT, and following discussion with other stakeholders are:

- layering—where both instruments continue to apply to all entities;
- ‘tax enforces budget’—where the tax rate applies in the event that emissions exceed an entity’s budget;
- hybrid options with trading—where entities are allowed to trade budget allocations between themselves, and the tax determines the maximum and/or minimum price of these trades; and
- differential instruments—where different instruments are applied to different entities.

Within each category, there are a range of variants, as explained in the main report. The eight core principles were also agreed through the same process and following a review of a wider selection of principles evident in existing South African policy documents. The eight core principles are:

1. **Emissions reduction effectiveness:** the interface option should be effective at reducing emissions.
2. **Emissions certainty:** the interface option should give policymakers and other stakeholders confidence that it is possible to meet a particular emission level. This could apply both to the flow of emissions at a particular point in time and—from a climate change perspective, more importantly—the cumulative emissions over a period of time.
3. **Cost-effectiveness:** the interface option should minimise the additional costs that society as a whole faces in order to reduce emissions, typically expressed on a cost per tonne of CO_{2e} reduced basis.
4. **Polluter pays principle:** the interface option should ensure that environmental costs are internalised and that increases or higher net levels of emissions lead to higher financial costs.
5. **Equitable treatment:** the interface option should treat firms and individuals that are in a similar situation—in terms, for example, of the emissions they are responsible for—in a similar way. This is both a principle that has its own merits and also one that helps to reduce the risk of competitive distortion.
6. **Distributional issues:** the interface option should not impose a disproportionate burden on the poorest and most disadvantaged in society.
7. **Feasibility and simplicity:** the interface option should be feasible for the responsible government agencies to design and implement, and feasible and simple for those regulated by the option to comply with. It should be noted that there is a link between this principle and the principle that the interface option should build on existing processes: options that build closely on existing processes are likely to be easier to design and implement.

8. **Sensitivity to international competition:** the interface option should not unduly disadvantage South African firms competing with firms based overseas not subject to the same intensity of emissions reduction regulatory effort.

The results of this analysis show that mitigation policy in South Africa faces something of a trilemma; resolving this trilemma requires policymakers and stakeholders to make judgements over which principles should be given greatest weight in policymaking. The carbon tax offers cost-effective abatement but limited emissions certainty (at least in the short term) and raises concerns among some business stakeholders over competitiveness concerns (notwithstanding important design features intended to address these issues); budgets offer emissions certainty but may be very cost ineffective and potentially have even more severe competitiveness issues; while an emissions trading scheme (ETS)—which could offer emissions certainty and cost-effective abatement, plus the opportunity to use free allowances to address competitiveness concerns—faces a number of practical challenges in South Africa, at least in the short–medium term. These tensions mean that different approaches may be favoured by stakeholders who attach more or less weight to different principles. The suggestions in this report reflect both our analysis and our understanding of how different principles may be traded off given the views of different policymakers and other stakeholders.

In the short term (between 2020–25) the ‘tax enforces budget’ option whereby entities pay a tax on those emissions in excess of their budget² is probably the easiest and most practical way to interface the instruments and provide a price incentive at the margin to reduce emissions. It is also sensitive to international competitiveness which is likely to be important given the economic structure of the South African economy, and it is an approach that can also generate government revenue that can either support the general budget or be recycled to reduce distributional impacts. However, crucially, for this interface to be effective at reducing emissions and providing enhanced emissions certainty, budgets would need to be set at a *more ambitious level* than they would be if set in isolation; the tax rate may also need to be higher (and constant across the economy). This option effectively creates an alternative means of complying with the budget: rather than reducing emissions, entities can elect to pay the carbon tax on emissions in excess of the budget. As such, the carbon tax provides a ‘safety valve’ that reduces the risk that the budget will be set at a level that requires very costly abatement to be pursued. In turn, this should allow policymakers to be more aggressive in using the budget to drive emission reductions in the economy.

Ideally, at the same time, or shortly thereafter, the trading of budgets might be introduced. This would effectively convert the interface option into an ‘absolute baseline and credit’ with a ceiling price: entities would have individual budgets set and could meet these budgets by either reducing emissions themselves or by purchasing emission reductions from others who had or were confident of meeting their budgets. The tax rate would set the maximum price of these trades. The introduction of trading would ensure that entities have a continuous incentive to reduce emissions even if their emissions are below the budget. It would also further enhance the cost-effectiveness of the system: as an alternative to paying the tax on their emissions in excess of the budget, entities could instead choose to purchase budgets from others, if those entities were

² Entities could also retain the right to use international and domestic offsets for compliance against their budgets.

in a position to reduce and then sell their emission reductions at a cost or price lower than the ceiling price. This greater cost-effectiveness would, in turn, allow emissions reduction ambition to be increased over time.

It may be appropriate to introduce restrictions on trading for Sasol in order to deal with market power in emissions trading concerns. The predominance of Sasol in the emissions profile of the South African economy may introduce concerns over trading for this company. As such it may be necessary to restrict the extent to which Sasol would be allowed to buy or sell its emissions budget to a certain percentage of its initial budget, although further detailed work on the precise percentage would be required and it would be necessary to discuss the feasibility of such a restriction with the Competition Commission. Policymakers could also consider liberalisation of offset credit markets to allow for the further supply of credits, although the costs and benefits of this are beyond the scope of this report and have not been considered in detail. The treatment of the electricity sector in this regard is discussed further below.

In the medium term, beyond 2025, as emissions have to first plateau and then decline, policy will likely have to become more ambitious, necessitating an evolution of the policy regime. This could be achieved in one of two ways:

- If the country wishes to pursue a quantity-based ETS mechanism, the stringency of the budgets allocated to entities would need to increase particularly quickly, but some additional 'budget' would be auctioned by the government. The sum of the budget allocated to firms and auctioned would be aligned with the PPD trajectory.
- If the country wants to pursue a price-based mechanism, as it has chosen to do to date, then the budget would also need to become increasingly stringent. However, no budget would be auctioned. Instead, as the budget became increasingly scarce, entities would end up paying the tax (buy-out price) over an increasing proportion of their emissions. Eventually the budgets could shrink to zero and the tax would need to be paid on all emissions.

Under either approach the implication would be that a market-based mechanism (either through a tax or a quantity mechanism) would cover an increasing proportion of emissions over time, increasing the focus on the polluter pays principle and providing increasingly strong incentives for the cost-effective structural transition to a low-carbon economy. At the same time, introducing a price floor for the minimum price of trading would be valuable, especially if the quantity-based ETS mechanism is adopted.

The treatment of the power sector is a particularly important aspect of the South African policy configuration, given it accounts for a large proportion of South African emissions. Discussions with stakeholders reveal considerable differences regarding the future evolution of the electricity sector in the country. These different future trajectories could have substantial impacts for how the sector is treated by mitigation policy. Two broad categories of options can be distinguished.

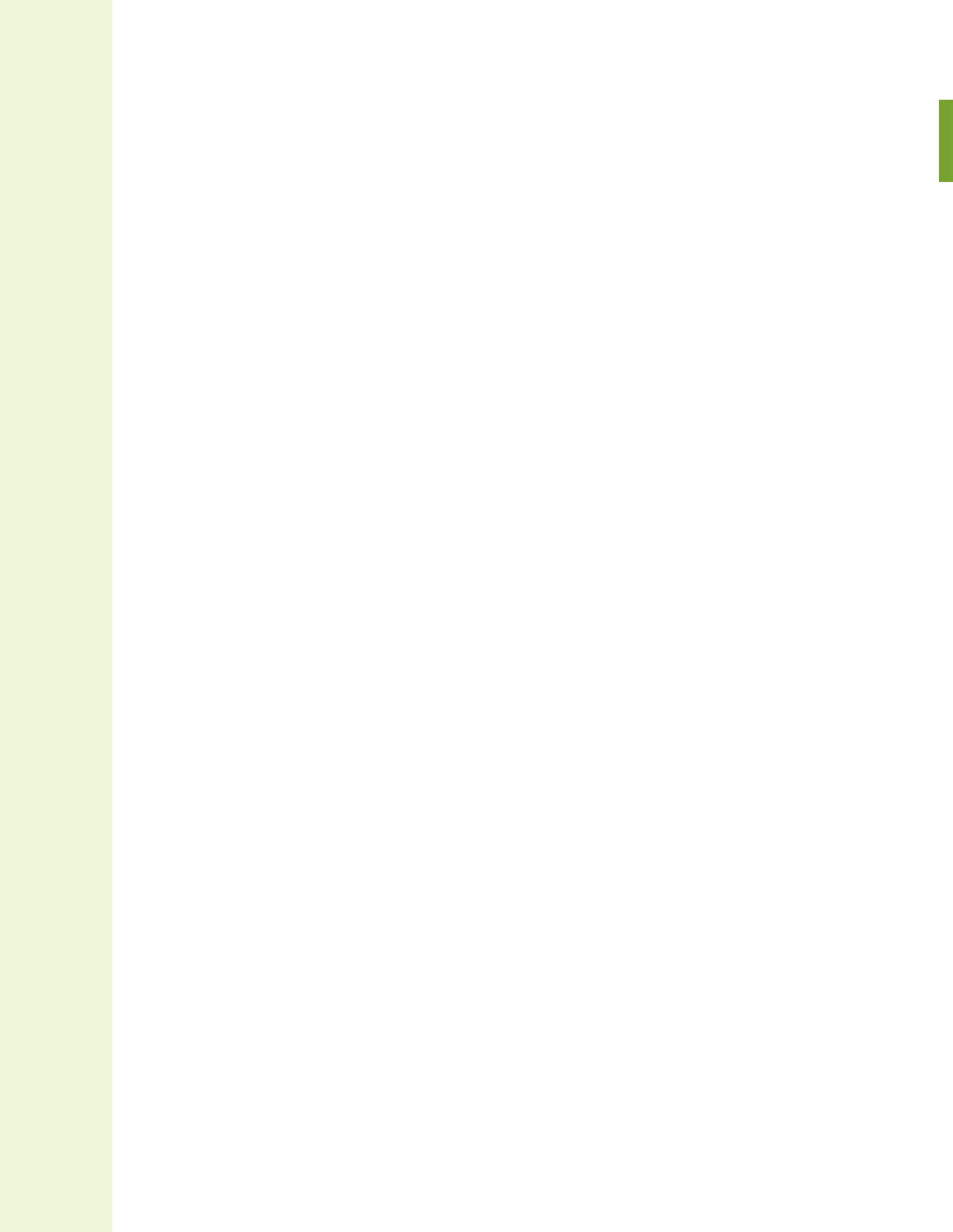
Under the first option, the electricity sector would be treated similarly to the rest of the economy. In the short term, entities within the sector would have a budget set and be required to pay a tax for emissions in excess of the budget. These budgets would be informed by the sector's

Integrated Resource Plan (IRP) and the PPD trajectory, but would act as a compliance instrument (as they would elsewhere in the economy) rather than just as planning tools. The budget may even be relatively tighter than elsewhere in the economy given the relative lack of leakage issues in the electricity sector and because a relatively tight budget would likely lead to a carbon price signal being embedded in electricity prices, increasing the incentives across the economy for efficiency in the consumption of electricity. Firms other than Eskom would have the option to trade their budget. However, Eskom, for the same reasons as for Sasol, would likely need to face restrictions on the extent that it could trade its budget. A broadly common treatment between the electricity sector and the rest of the economy is consistent with a view in which the sector is steadily reformed into a competitive market with cost-reflective prices and all firms respond to incentives in a commercial fashion. It would promote the alignment of South Africa with international best practice on both mitigation policy and power sector structure. Indeed, the greater use of carbon pricing envisioned could be one part of the package of reforms to promote power sector reform in the country.

The second option would apply a differential instrument in the electricity generation sector.

This approach would be consistent with the electricity sector remaining broadly as it is today, with policy constraints making it difficult to envisage an across-the-board increase in electricity price; Eskom continuing to dominate the sector; and with the view that the governance arrangements of Eskom are unlikely to lead it to respond effectively to mechanisms that place increasing emphasis on a carbon pricing signal. In this scenario, it may make more sense to place a budget on Eskom that just focuses on its carbon intensity. This budget would be informed by the IRP and the PPD. The existing governance structures between Eskom and the government would be used to ensure compliance with the intensity-based budget. At the same time, other entities would have their Scope 2 emissions included within their carbon budgets, based on an estimated emissions intensity of the electricity sector that would be updated periodically. This would provide an incentive for firms to reduce their Scope 2 emissions without an across-the-board increase in electricity price, which may have adverse impacts on vulnerable households. It could also increase the liquidity in the market for trading of budgets as many entities in South Africa have more Scope 2 emissions than Scope 1 emissions. However, there would be less incentive for households to improve their electricity efficiency, reducing overall emissions certainty.

A clear articulation of the strategic vision for South Africa's low-carbon economic transition would help policymakers and stakeholders navigate important medium-longer term strategic decisions such as those identified above. Throughout the consultation exercise supporting this analysis, it was clear that there were competing visions as to the broad contours by which South Africa intends to move toward a low-carbon economy. The lack of this strategic vision means that there is limited consensus on key issues, including the relative attractiveness of different policy options, the future evolution of the power sector and how this relates to mitigation policy, or the relative importance of different principles. The development of this strategic vision might also allow stakeholders to anticipate how policymakers might respond to future unanticipated shocks that may require a shift in policy and help stakeholders understand how the South African economy is expected to evolve and the possible job and economic development opportunities from a low-carbon future.



1 Introduction

In 2009, at the UNFCCC Conference of the Parties (COP) in Copenhagen, South Africa made a voluntary commitment to reduce its greenhouse gas (GHG) emissions by 34 percent in 2020 and 42 percent in 2025 relative to business-as-usual (BAU). This was part of a wider commitment by South Africa to contribute to the global effort in mitigating anthropogenic climate change and to transition to a lower-carbon economy. This was reaffirmed in its Intended Nationally Determined Contribution (INDC) submission to the UNFCCC, in advance of COP 21 in Paris in 2015, which envisages that emissions will peak in absolute terms by 2025 within a range of 398 to 614 MtCO_{2e}, plateau for approximately a decade, before beginning to decline in absolute terms from 2036, falling to a low within the range of 212 to 428 MtCO_{2e} by 2050 (South African Government, 2015). The range for emissions presented in South Africa's INDC are consistent with its Copenhagen Accord Pledge.

Among a suite of different policies, two, in particular, have been designed with the intention of delivering a significant proportion of these emission reductions:

- A carbon tax designed by the National Treasury to provide a price signal to producers and consumers of carbon-intensive products, creating an incentive to invest in cleaner technology and reduce emissions, where available. The carbon tax is expected to come into operation in 2017 at a headline rate of R120/tCO_{2e}, although the effective tax rate will initially be lower as a result of a series of tax free allowances.
- A series of carbon budgets designed by the Department of Environmental Affairs (DEA) envisaged to provide a GHG emissions allowance (in other words, a cap), against which physical emissions arising from the operations of a company during a defined time period will be tracked. In the period to 2020, the carbon budgets will not be a compliance instrument but rather will be used to increase understanding of the emissions profile of participating companies, and to establish monitoring, reporting, and verification (MRV) processes. Beyond 2020, they are intended to become compulsory.

In the period to 2020, the integration between the two instruments is established. Firms that have been allocated carbon budgets by the DEA will be entitled to an additional 5 percent tax free allowance. This is in addition to a basic tax free allowance of 60 percent plus other allowances that will be provided for firms if, for example, they are considered to be exposed to the risk of carbon leakage or if they have significant process emissions.

The objective of this assignment is to review the principles used in approaching greenhouse gas emissions reduction in South Africa and of combining the carbon budget and carbon tax;³ and assess the appropriateness and effectiveness of combining the carbon budget with the carbon tax in achieving

³ Carbon taxes imposed on transport fuels at the pump are excluded from the analysis because emissions from transport fuels do not fall within the scope of carbon budgets.

South Africa's emissions reduction goal beyond 2020. While both instruments have merits, economic theory would suggest that there could be risks associated with applying both instruments to the same emissions at the same time. Stakeholder consultation also revealed significant concerns about this option. There is a desire to understand how the instruments may be aligned to ensure that South Africa's mitigation policy is placed on a coherent footing in the longer term, so that it can help deliver the emissions reductions to which the country has committed. South Africa's mitigation system is reiterative work which will be refined over time. This analysis will be considered as an input to inform the second phase of the mitigation system.

The remainder of this paper is structured as follows:

- Section 2 outlines some key principles from South Africa's mitigation policy that can help guide how to assess different ways to establish an interface between the two instruments;
- Section 3 outlines the current planned design features of each of the policy instruments;
- Section 4 identifies some of the underlying economic principles associated with the use of these two instruments and provides insights from international experience on integrating multiple mitigation policies;
- Section 5 outlines the different integration options considered;
- Section 6 specifies the advantages and disadvantages of these different options;
- Section 7 concludes; and
- The annexes provide more information on the background to the principles assessment presented in section 2 and some of the international precedents that have informed the analysis.

2 Principles Used to Assess Interface Options

This section sets out a range of principles that guide South Africa's mitigation policy. These principles can be used to assess different ways in which to interface the two instruments; options for interfacing the two instruments that are consistent with, or promote, a particular principle are more desirable than options which are inconsistent with that principle.

The bulk of the principles are derived explicitly from various South African policy documents but these have been corroborated by international analysis. The key documents that have been explored from the South African context are:

- Overarching national policy documents, especially Chapter 5 of the National Development Plan;
- Various documents published by the DEA including the National Climate Change Response White Paper and the Carbon Budget Design Document; and
- Documents published by the National Treasury including the Environmental Fiscal Reform Paper, the Carbon Tax Options discussion paper and the Carbon Tax Policy Paper.

Many of the principles expressed in these documents are consistent with one another. Therefore, to avoid significant repetition, in section 2.1 we briefly describe the key distinctive features of the principles from each of these documents. A full list of principles associated with each document is provided in Annex B. Section 2.2 synthesizes the different principles and identifies the core principles relating to this study.

2.1 Summary of principles from existing documentation

The National Development Plan identifies 14 explicit principles. These are at a very high level of abstraction, reflecting the status of the document as one which guides South Africa's overall development trajectory. Among the most relevant for the emissions mitigation policy are:

- **Ecosystems protection.** Acknowledging that human well-being is dependent on the health of the planet.
- **Full cost accounting.** Internalising both environmental and social costs in planning and investment decisions, recognising that the need to secure environmental assets may be weighed against the social benefits accrued from their use.
- **Transformative.** Addressing the structural and systemic flaws of the economy and society with strength of leadership, boldness, visionary thinking, and innovative planning.

- **Delivering a managed transition.** Building on existing processes and capacities to enable society to change in a structured and phased manner.

The National Climate Change Response White Paper has a series of nine explicit principles and also identifies a further six factors that will guide its overall approach to climate change response that in many ways resemble principles. The nine explicit principles place a strong emphasis on considering the distributional implications of both climate change and the associated policy response across multiple dimensions. This includes recognising the importance that countries should take climate action according to their common but differentiated responsibilities and respective capabilities; that equity is crucial and policy should address the needs of the poorest and take into account the special needs and circumstances of localities and people who are particularly vulnerable to the adverse effects of climate change; and that it is necessary to take account of intra- and intergenerational sustainability. The principles also acknowledge the polluter pays principle. The six factors that guide how South Africa should structure its climate response include recognition that climate change policy should also be developmental such that it has significant economic growth, job creation, public health, risk management, and poverty alleviation benefits, and that policy should be balanced and cost effective.

The Carbon Budget Design Document provides a series of more detailed principles guiding the design of this instrument. This recognises the importance of consistency between allocation of the carbon budget and subsequent accounting and reporting of emissions against that budget. It also identifies the sectors in which carbon budgets might be set and that, for Phase 1 of the carbon budget process up to 2020, they should provide support to existing and planned future operations.

The 2010 carbon tax discussion paper identifies seven 'issues which must be carefully addressed in carbon tax design'; these can be considered as principles. These include ensuring environmental (emissions reduction) effectiveness, that distributional and competitiveness issues should be taken into account, the importance of technical and administrative feasibility, and the need for alignment with other policy options. Many of the same principles are also found in the Environmental Fiscal Reform paper, which also acknowledges the importance of public support for the tax.

A review of international documentation suggests close overlap between the principles expressed in South African policy documents and those used in other jurisdictions. These documents place a strong emphasis on environmental (emissions reduction) and cost-effectiveness; feasibility (both technically and politically); equity, including the idea of the polluter pays principle; and the need to carefully consider policy overlaps to ensure that perverse incentives are not created.

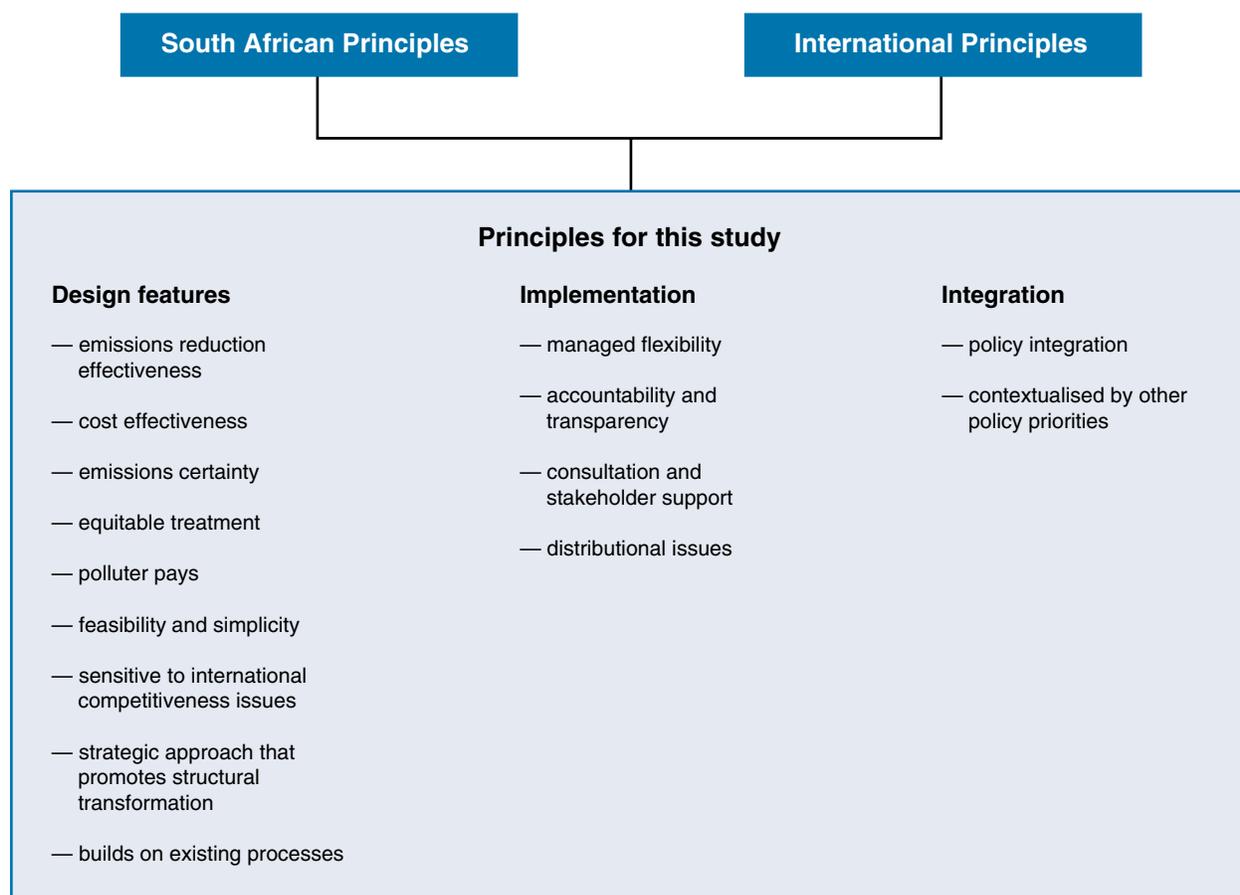
2.2 Synthesis and identification of principles related to policy integration

We have identified 15 principles that are relevant for considering the strengths and weaknesses of different ways to interface the carbon tax and carbon budget. This list starts from the long list of principles summarised above and described in more detail in Annex B. It then focuses on those that are relevant for considering how South Africa might seek to achieve emissions reductions objectives, rather than what those objectives might be (which has already been determined into the medium term). This means, for instance, that principles such as common but differentiated responsibility and respective capabilities,

intergenerational equity, or the precautionary principle are not considered in this list. We also seek to aggregate principles with broadly common intent even if they are expressed somewhat differently across different documents, as well as to give more attention to those that are common across many or all of the documents reviewed. It should be stressed that this synthesis is done purely for the purposes of supporting and simplifying the analysis in this study, it is not intended in any way to replace the principles articulated in the various documents.

These 15 principles are grouped into three main categories: design features, implementation and integration (Figure 1). Design features relate to the way in which instruments might be designed; implementation concerns the way in which instruments might be decided upon and introduced; and integration relates to the way in which different policies should be combined. This is intended as a heuristic device only.

FIGURE 1. Fifteen principles grouped into three categories



Source: Vivid Economics, DNA Economics and Tyler.

Table 1 provides further detail on each of these principles and how they relate to various South African policy documents.

TABLE 1. Full list of principles used to assess interface options

Principle	Description as it relates to this study	Examples from national policymaking documents	Example from DEA policy documents	Examples from NT policy documents	International experience
Emissions reduction effectiveness	The integration of the two instruments should promote emissions reductions in line with South Africa's targets	Acknowledge that human well-being is dependent on the health of the planet	Managing our ecological, social and economic resources and capital responsibly for current and future generations	Environmental (emissions) effectiveness 'key principle to be addressed in carbon tax design'	Common and core principle found in all major publications to achieve intended targets
Cost-effectiveness	The integration of the policy instruments should seek to reduce the economic cost imposed on society for each tonne of emissions reductions	Look for synergies between sustainability, growth, competitiveness and employment creation . . . Invest early in low-carbon technologies that are least-cost	Prioritising climate change responses that have both significant mitigation and adaptation benefits and that also have significant economic growth . . . benefits Implementing a balanced approach . . . in terms of cost-benefit, prioritisation, focus, action, and resource allocation	The impact of environmentally related taxes on domestic industries and other aspects of the economy such as employment and inflation are of critical importance Documents also note that market-based instruments score well on static and dynamic efficiency	Common and core principle found in all major publications to ensure maximisation of benefits and reduction of costs
Emissions certainty	The integration of the policy instruments should give policymakers confidence that a certain emissions reduction will be achieved (note that this is different from effectiveness, as a policy combination might provide for high expected emissions reductions but with high variability)	Not explicitly mentioned	Not explicitly mentioned	Not explicitly mentioned	Reasonably common principle used to assess policies

Principle	Description as it relates to this study	Examples from national policymaking documents	Example from DEA policy documents	Examples from NT policy documents	International experience
Equitable treatment	The interface option should treat firms and individuals that are in a similar situation—in terms, for example, of the emissions they are responsible for—in a similar way	Not explicitly mentioned	Not explicitly mentioned	Not explicitly mentioned in documents but an economy-wide carbon price by its nature will lead to firms with the same emissions facing the same financial liabilities. This is reduced somewhat in the South Africa case by the different tax rates for different firms.	A level playing field for firms is an international best practice for policy instruments
Polluter pays	The interface option should ensure that environmental costs are internalised and that increased or higher levels of emissions lead to higher cost	Internalise both environmental and social costs in planning and investment decisions, recognising that the need to secure environmental assets may be weighed against the social benefits accrued from their use	Those responsible for harming the environment paying the costs of remedying pollution and environmental degradation and supporting any consequent adaptive response that may be required	The tax should, over time, be equivalent to the marginal external damage costs of carbon	Common principle, often grouped with fairness in international literature
Feasibility and simplicity	The interface option should be technical and administratively feasible and its design simple. It should have reasonable administrative cost for both administrators and those subject to regulation.	Develop coherent and aligned policy that provides predictable signals, while being simple, feasible, and effective	Aligning our domestic measures to reduce the country's GHG emissions and adapt to the adverse effects of climate change with our unique national circumstances, stage of development, and capacity to act	Identifies need for carbon tax design to be technically and administratively feasible	Technical, administrative, financial, and political feasibility are common principles

(continued)

Principle	Description as it relates to this study	Examples from national policymaking documents	Example from DEA policy documents	Examples from NT policy documents	International experience
Sensitive to international competitiveness issues	The interface should consider cost impacts on sectors, particularly to sectors facing international competition	Look for synergies between sustainability, growth, competitiveness	Not explicitly mentioned	Competitiveness— Industries that participate in international trade might be at a disadvantage when competing with countries that do not price carbon	All explicit carbon pricing policies include some form of support for sectors and firms considered to be at risk of carbon leakage/ at risk of being subject to 'unfair' international competition
Strategic approach that promotes structural transformation	The interface should provide the ability to incentivise structural transformation, such as channelling investment into specific priority areas	<p>Look for synergies between sustainability, growth, competitiveness, and employment creation</p> <p>Follow a systematic approach that is responsive to emerging risk and opportunity, and which identifies and manages trade-offs</p> <p>Address the structural and systemic flaws of the economy and society with strength of leadership, boldness, visionary thinking, and innovative planning</p>	<p>Strategic approach for South Africa's climate change response is needs driven and customised; developmental; transformational, empowering and participatory; dynamic and evidence-based; balanced and cost effective; and integrated and aligned</p> <p>Implementing policies and measures to address climate change at a "scale of economy" . . . fundamentally underpinned by a major shift toward sustainable consumption and production patterns, which decouples growth and development from any negative impacts on the environment and society</p>	Not explicitly mentioned although, as discussed below, carbon taxes are intended to set strong dynamic incentives for action	Many countries aim to adopt a strategic approach to policies, although it is not always mentioned explicitly in international guidance

Principle	Description as it relates to this study	Examples from national policymaking documents	Example from DEA policy documents	Examples from NT policy documents	International experience
Builds on existing processes	The interface should use existing infrastructure (technical and administrative) and processes and integrate sectors with broader national climate change targets	Build on existing processes and capacities to enable society to change in a structured and phased manner	Recognising that this policy has not been developed in a vacuum and many sectors have already researched and have experience in implementing policies and measures to address the challenges of climate change	Not explicitly mentioned	Not explicitly mentioned
Managed flexibility	The interface should encourage predictability for stakeholders as to the costs they might face, while maintaining a degree of flexibility to adapt to changing circumstances for regulators and regulated entities	Sound policymaking—develop coherent and aligned policy that provides predictable signals	Not explicitly mentioned but the five-year duration for budgets would provide certainty for entities within this period and flexibility for policymakers between budgets	Taxes should, as far as possible, be certain. . . . Certainty in this context requires that a taxpayer be reasonably certain of what his or her tax liability will be in any given set of circumstances.	Common principle to acknowledge the tension and views of different stakeholders
Accountability and transparency	The interface should have a transparent process and it should be clear by whom and how decisions related to the design have been made	Lead and manage, as well as monitor, verify, and report on the transition	Carbon budget design document discusses need for consistency between allocation and accounting, and accounting and reporting	Not explicitly mentioned	Hallmark of a successful implementation of schemes and recognised in practical guidance
Consultation and stakeholder support	The design and evolution of the interfaces should include stakeholder consultation and should have sufficient stakeholder acceptance to be politically feasible	Be aware of mutual responsibilities, engage on differences, seek consensus, and expect compromise through social dialogue	Enhancing public awareness and understanding of climate change causes and impacts to promote participation and action at all levels	With every tax reform, there are likely to be winners and losers, and these groups of stakeholders need to be clearly identified. All relevant stakeholders should be engaged in the assessment process	Not always part of design principles but recognised in the implementation of policies

(continued)

Principle	Description as it relates to this study	Examples from national policymaking documents	Example from DEA policy documents	Examples from NT policy documents	International experience
Distributional issues	The interface option should not impose a disproportionate burden on the poorest and most disadvantaged in society	Just, ethical and sustainable—recognise the aspirations of South Africa as a developing country and remain mindful of its unique history	Climate change policies and measures should address the needs of the poor and vulnerable	Government should take measures—either in tax design or through complementary expenditure programmes—to offset the burden such a tax will place on poor households	The distribution of impacts and fairness is a standard measure to analyse and compare policies
Policy integration	The interface should account for and integrate with existing sectoral and economy wide policies	Follow a systematic approach . . . which identifies and manages trade-offs	Coherent alignment with the relevant policies and legislation	The tax should be aligned with other government policy interventions From an environmental point of view, it is important therefore that any tax measure is aligned with other regulatory or voluntary approaches	Increasing focus on how to integrate emissions reduction policies with the broader policy suite
Contextualised by other policy priorities, especially job creation and economic development	The interface should be able to be leveraged where possible to promote other policy priorities. Interface options that promote job creation should be favoured	Look for synergies between sustainability, growth, competitiveness, and employment creation, for South Africa to attain equality and prosperity	Prioritising climate change responses that have both significant mitigation and adaptation benefits and that also have significant . . . job creation, public health, risk management, and poverty alleviation benefits. . . Practical interventions will be informed by accurate assessments of the capacity of various sectors to adapt to a lower-carbon environment. Net job creation will be a key performance indicator. . .	The extent to which environmentally related taxes can be designed to contribute to policy goals such as job creation, poverty alleviation, and the expansion of basic services is also important	Becoming increasingly recognised as important in the global discourse

Source: Vivid Economics, DNA Economics and Tyler.

Discussions with NT and DEA, and taking account of consultations with stakeholders led to a particular focus on eight key principles. While all of the principles discussed above are used to assess the different interface options to the extent possible,⁴ it was agreed with the NT, DEA and through the stakeholder consultation process that eight principles should be given particular attention. These are:

1. **Emissions reduction effectiveness:** the interface option should be effective at reducing emissions.
2. **Emissions certainty:** the interface option should give policymakers and other stakeholders confidence that it is possible to meet a particular emissions level. This could apply both to the flow of emissions at a particular point in time and—from a climate change perspective, more importantly—the cumulative emissions over a period of time.
3. **Cost effectiveness:** the interface option should minimise the additional costs that society as a whole faces in order to reduce emissions, typically expressed on a cost per tonne of CO₂e reduced basis.
4. **Polluter pays principle:** the interface option should ensure that environmental costs are internalised and that increases or higher net levels of emissions lead to higher financial costs.
5. **Equitable treatment:** the interface option should treat firms and individuals that are in a similar situation—in terms, for example, of the emissions they are responsible for—in a similar way. This is both a principle that has its own merits and also one that helps to reduce the risk of competitive distortion.
6. **Distributional issues:** the interface option should not impose a disproportionate burden on the poorest and most disadvantaged in society.
7. **Feasibility and simplicity:** the interface option should be feasible for the responsible government agencies to design and implement, and feasible and simple for those regulated by the option to comply with. It should be noted that there is a link between this principle and the principle that the interface option should build on existing processes: options that build closely on existing processes are likely to be easier to design and implement.
8. **Sensitivity to international competition:** the interface option should not unduly disadvantage South African firms competing with firms based overseas not subject to the same intensity of emissions reduction regulatory effort.

Stakeholders also identified that some of the other principles might also be considered as having primary importance; however, for various reasons, attaching this status to them was considered unnecessary. A number of business representatives argued that policy certainty should also be considered a primary principle. However, this is more influenced by the way in which any given interface option is implemented than by the underlying design features of that option.⁵ Some stakeholders also suggested that 'contextualised by other policy, especially job creation and economic development' be considered a primary principle. However, this is captured by a combination of cost-effectiveness (interface options that impose

⁴ As discussed in more detail in the subsequent sections, assessment of the interface options against some of these principles requires a granularity on the design of the instruments beyond 2020 that is not currently available.

⁵ As discussed further below, this is also an issue for some of the other principles, but is particularly pronounced for this option.

more costs on society per tonne of emissions reduction will hold back economic development and job creation more than those interface options that impose fewer costs) and sensitivity to international competition (options that are less sensitive to international competitiveness will restrict job development and economic development more than those that are more sensitive to this issue).

Nonetheless, the analysis in the subsequent sections identifies the most important cases where the different interface options might perform relatively well or poorly against *all* principles. While primacy is given to the eight principles identified above, if the different interface options perform particularly well or poorly against any of the principles, this is discussed, in order that policymakers can take an informed view of the appropriate interface option, taking account of all of the germane issues.

3 Planned Design Features of Each Instrument

This section provides more detail—to the extent available—on how each instrument, in isolation, might be expected to operate in the period to 2020. This is discussed in sections 3.1 and 3.2, respectively. This, in turn, allows identification of how the instruments might be expected to operate in the period beyond 2020 without policy reform to enhance alignment. In other words, this provides the ‘departure point’ from which the instruments may have to be adjusted in order to promote alignment beyond 2020. This departure point is discussed in section 3.3. Throughout this and subsequent sections, the analysis refers to the impact of instruments on ‘entities’; there remains important debate in the South African context on the appropriate point of regulation and the extent to which this is or should be the same in different instruments. While this is an important debate, in order to focus on the underlying features of each instrument, and how they may be best aligned, the report abstracts away from this issue.

3.1 Carbon tax to 2020

The design of the carbon tax is intended to balance South Africa’s mitigation goals with the need to reduce poverty and maintain trade competitiveness. While providing a price signal to encourage the transition to a low-carbon economy, the proposed policy is also intended to reduce the risk of negative competitiveness implications and leakage through special provisions for sectors considered to be at risk. It is also intended that the revenues raised from the carbon tax could be used to address some of the potentially negative social impacts.

Specifically, the key features of the proposed tax policy, as laid out in the Carbon Tax Policy Paper (2013) and the draft Carbon Tax Bill (2015), are the following:

- the tax is to be levied on Scope 1 emissions—these are emissions that result from fuel combustion, gasification, fugitive emissions, and nonenergy industrial processes;
- the tax will be levied at R120/tCO₂-equiv in 2017, and the National Treasury has indicated in the guidance provided in the 2013 Carbon Tax Policy Paper, that the rate will increase at a rate of 10 percent per annum, and is likely to apply until 2020;
- certain allowances and reductions are included;
- a 60 percent basic tax-free allowance will apply to all sectors during the first phase;
- a further tax-free allowance of up to 10 percent is available to firms in ‘trade-exposed’ sectors;
- a further 10 percent tax-free allowance will be provided to firms in sectors where there is a structural or technical inability to make reductions (i.e., process and fugitive emissions);

- firms will be able to use domestic offsets in relation to 5 or 10 percent of their gross tax liability (i.e., before the impact of exemptions);
- a 'Z-factor' will reward firms that have a lower emissions intensity than an agreed benchmark, with a further tax-free allowance of up to 5 percent;
- an additional 5 percent tax-free allowance will be available to companies having received carbon budgets;
- there will be a full exemption during the period to 2020 for the agriculture, forestry, and other land use activities as well as waste management sectors; and
- although a number of options for using the revenue raised by the carbon tax have been identified,⁶ the priority in the period to 2020 will be to ensure that the carbon tax does not lead to an increase in the price of electricity, through a credit for the levy payable on electricity from nonrenewable sources and also a credit for the premium charged for renewable energy. It is understood that this will account for most or all of the revenues raised in the period to 2020.

3.2 Carbon budgets to 2020

Company-level carbon budgets were introduced in the National Climate Change Response Policy as a mechanism through which South Africa's mitigation commitments could be translated into emissions targets for subsectors and companies. A carbon budget is defined in the Carbon Budget Design Document as (Department of Environmental Affairs, 2015):

... a greenhouse gas (GHG) emissions allowance, against which direct emissions arising from the operations of a company, during a defined time period will be accounted. The term "carbon" in carbon budget is shorthand for carbon dioxide, and further, for all GHGs accounted for in the latest South African inventory (2010).

The first phase of carbon budgets in South Africa (2016–20) is being implemented as a voluntary pilot in preparation for a second mandatory phase to commence in 2021. Phase 1 does not include compliance measures. The decision to start with a voluntary phase was influenced by a lack of an appropriate legal instrument.

Carbon budgets were allocated to a selection of individual entities in the form of a cumulative target level of GHG emissions that they are permitted to emit over the five-year carbon budget period. The Carbon Budget Design Document states that while five years is a sufficiently long period of time to allow

⁶ In November 2015, the media statement accompanying the Draft Carbon Tax Bill identified more specifically how the revenue raised by the carbon tax would be recycled. In addition to the measures used to ensure electricity price neutrality, this identified funding for the energy efficiency tax incentive already being implemented, additional tax relief for rooftop (embedded) solar PV energy as already provided for in the 2015 tax legislation, additional support for free basic electricity to low-income households, additional allocations for public transport, and measures to encourage the shift of some freight from road to rail.

entities the flexibility to take into account fluctuations in market conditions and output while planning to meet their carbon budgets, it is not too long to allow the DEA to respond to developments in local and international conditions and the evolution of local mitigation policy. The entities participating in the first phase of the carbon budgets were selected from a set of target sectors based on whether they emit more than 100,000 tonnes of GHG emissions per annum, or produce the 'same primary product' as a company that falls within this category. Entities that did not meet this criteria, but still wished to participate, could voluntarily enter into negotiations with the DEA to also be allocated carbon budgets.

Phase 1 carbon budgets included the following design features:

- carbon budgets were allocated to companies to support both current operations and existing expansion plans;
- there was no consideration of any national or sectoral mitigation targets when carbon budgets were set;
- companies are expected to report annually on their progress in terms of meeting their carbon budgets, and report at the end of Phase 1 on whether they have remained within or exceeded their carbon budgets, but there will be no legal consequences if companies exceed their carbon budgets;
- no transfer of unused portions of carbon budgets from the first to subsequent phases will be allowed;
- no transfer of portions of their carbon budgets between companies will be allowed during Phase 1; and
- only emissions from a company's own operations (Scope 1 emissions) will be included in carbon budgets.

The DEA has explicitly identified the carbon budget process in the period to 2020 as an opportunity for learning by doing. While it intends to use the experience gained by implementing the first phase of carbon budgets to design the second and subsequent phases, all Phase 1 design elements will be re-evaluated when the next phase of carbon budgets is designed, and new elements may also be included in the next phase while some elements of Phase 1 may not be retained in Phase 2.

Although there is no legal requirement for companies to remain within their carbon budgets in the period to 2020, there are legal requirements regarding the reporting of mitigation actions. The Pollution Prevention Plan Regulations issued under the National Environmental Management: Air Quality Act (Act 39 of 2004) legally require companies to:

- describe interventions that will be implemented to reduce GHG emissions over the course of the next five years, and the expected mitigation impact that these actions will have, in a pollution prevention plan to be approved by the Minister of Environmental Affairs; and
- submit annual progress reports that outline the mitigation actions that were implemented within the last year, and if relevant, details of any deviations from the approved pollution prevention and remedial action to address deviations.

3.3 Assumed 'departure point' for 2021 and beyond

Our analysis assumes that, if there were no further efforts to enhance alignment between the carbon tax and the carbon budget some, but not all, of the design features of the carbon tax would remain in the period beyond 2021. The key design aspects that would *change* in the period beyond 2020 are as follows:

- The headline tax rate would no longer rise by 10 percent but rather by inflation. Assuming a medium-term inflation projection of 5.5 percent, this would imply a carbon tax rate of R168.5/tCO₂ in 2021, R177.8/tCO₂ in 2022 and R187.5/tCO₂ in 2023.
- The basic tax-free allowance, set at 60 percent in the period to 2020, would begin to fall. Our analysis assumes that it might fall by ten percentage points per year so it would be 50 percent in 2021, 40 percent in 2022 and so on. In conjunction with the assumptions on the headline rate above, this would imply that the effective tax rate, before the impact of further allowances might be R84.3/tCO₂ in 2021, R106.7/tCO₂ in 2022 and R131.3/tCO₂ in 2023.
- There would be no additional (e.g., the extra 5 percent) tax allowance for entities that also receive a carbon budget. In the period to 2020, this is provided as an inducement for entities to adopt a voluntary carbon budget. As it is assumed that carbon budgets will become compulsory after 2020 (see below), this exemption becomes obsolete.
- It would no longer be the case that the primary use of revenues would be to preserve electricity price increases. Instead electricity prices could instead rise as a result of the carbon tax with the raised revenues available for other policies.

In relation to the budgets, our analysis assumes that many of the design elements of budgets will remain the same as in the period to 2020—for example, they would be set for entities on their Scope 1 emissions on a five-year basis with annual reporting requirements, and covering entities with annual emissions above the threshold in the target sectors—but with the following crucial differences:

- The budgets become mandatory for entities in 2021. Thus, if entities are found to exceed their budget over the five-year period, then they would be subject to an appropriate compliance mechanism.
- Budgets will be set through a combination of both a bottom-up assessment of an entity's emissions and its scope for reducing emissions, and a top-down assessment of the emissions that would be consistent with the national Peak Plateau and Decline (PPD) trajectory and each sector's Desired Emission Reduction Outcomes (DEROs). While the outcome of this combined bottom-up, top-down process cannot be predicted for individual entities, it would result in emissions below the business-as-usual trajectory (BAU) and consistent with the PPD target.

It should be stressed that this departure point for the tax and budget represent a set of assumptions used to enhance the clarity of the changes to one or both instruments that *might* be required in 2021 and beyond. While it is based on our understanding of the current documentation and intent of policy-makers, it does not represent an official policy position by National Treasury and/or DEA. It is used only to enhance the clarity and exposition of the subsequent analysis.

4 Properties of Budgets and Taxes and Insights on Integration

This section discusses the key advantages and disadvantages of the different instruments acting in isolation. Broadly put, when combining the carbon tax and carbon budget, the intention is to maximise the advantages provided by each instrument operating in isolation while aiming to reduce some of the disadvantages of each instrument. However, to do this, it is necessary to understand the properties of each instrument and what can and cannot be identified about their comparative advantages and disadvantages.

It then provides a brief summary of the key insights provided by international experience in seeking to combine multiple mitigation policy instruments. Reflecting the international interest in carbon pricing as a policy instrument, this literature focuses in particular on the combination of carbon pricing instruments with other mitigation policies; given the context in South Africa, this section places particular attention on the insights from this literature in relation to combining carbon taxes with other policy instruments. It complements the international experience provided in Annex A.

4.1 Advantages and disadvantages of the carbon tax and carbon budget

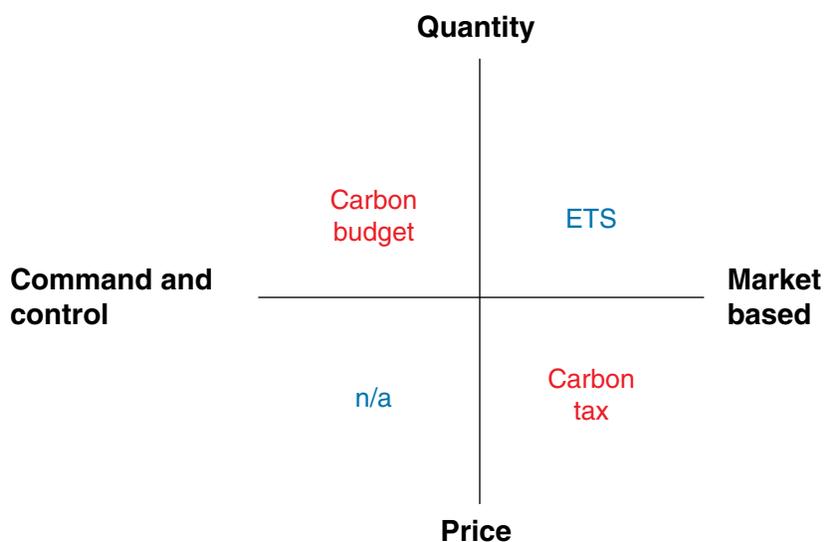
It is helpful to place the carbon budget and carbon tax in a simple policy taxonomy. This taxonomy is not comprehensive but rather seeks to highlight key features of mitigation instruments based on economic theory and literature that are relevant in the South African context. It distinguished policy instruments on two dimensions.

- *Command and control versus market based.* Command and control instruments specify either the emissions reductions that must be delivered by a particular firm or installation and/or the technologies that should be used to deliver reductions. The carbon budget is an example of a command and control instrument as it will specify the emissions reductions that a firm must make. Such instruments are attractive if policymakers wish to directly target investment activity in certain entities or sectors that are of importance to the economy. By contrast, market-based instruments, such as carbon taxes and emissions trading schemes (ETSs), provide flexibility as to how much individual entities choose to emit and which technologies they choose to use to reduce emissions. In the case of a carbon tax, for example, entities can either choose whether and how to reduce their emissions or, if all reductions are expensive, pay the tax at the designated rate.
- *Quantity versus price.* A quantity instrument reduces emissions by placing a fixed constraint on the amount of emissions from a certain source. The carbon budgets are a quantity instrument with the emissions defined at the locus of the individual firm, while an ETS places a fixed constraint on the total emissions from sources covered by the instrument. The attraction of this approach is that

it provides certainty over emissions. By contrast, price instruments, such as the carbon tax, reduce emissions by letting emitters decide on whether they wish to pay the tax for each tonne of emissions for which they are responsible. Theoretical literature shows that pricing instruments are preferable to quantity instruments when there is relatively more uncertainty about how much it might cost to reduce emissions than about how much damage those emissions might do (Hepburn, 2006). They may also be better at incentivising low-carbon investment as the price is often stable and known in advance. Pragmatically, price instruments (taxes) can be relatively easily integrated into existing tax systems.

Figure 2 depicts the two main instruments of focus for this study on this simple taxonomy (in red). It also depicts ETSs as an instrument that share some similarities with carbon budgets, as they set a constraint on the total quantity of emissions, but also with carbon taxes, as they are a market-based instrument that provides flexibility to individual entities as to how much they choose to abate. ETSs are discussed briefly further below.

FIGURE 2. Budgets and taxes fall into different instrument categories and target emissions quantity and price, respectively



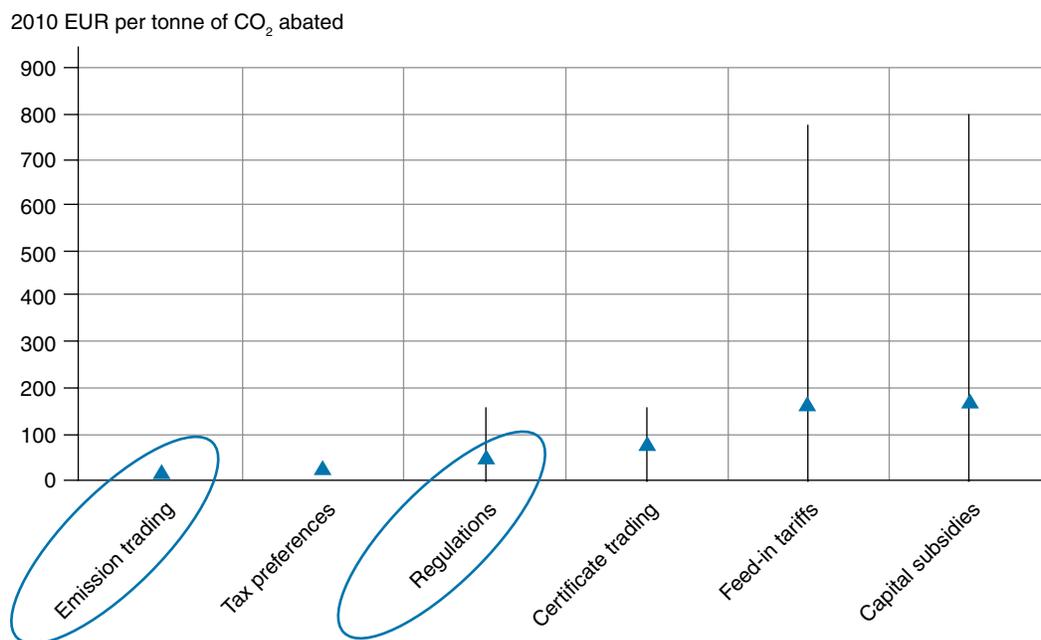
Source: Vivid Economics, DNA Economics and Tyler.

The key advantage of the carbon tax is that it will deliver cost-effective emissions reduction. As the typology shows, taxes are market-based instruments. Theoretical and empirical literature shows that market-based instruments tend to reduce emissions at a much lower cost to society per tonne of CO₂ than command and control instruments. For example, the OECD, in an international study (OECD, 2013), found that market-based instruments reduced emissions at a cost of less than €30/tCO₂ compared to up to more than €150/tCO₂ for regulatory (command and control) measures, as shown in Figure 3. This is because market-based instruments provide the same incentive to reduce emissions across the economy and allow those subject to the regulation to determine whether this is a strong enough incentive to reduce emissions: faced with this signal some entities will find it easy to significantly reduce emissions and will choose to do so; others will choose rather to pay the market price. It should be noted that the finding

that carbon pricing reduces emissions at least cost is predicated on using the same carbon price across all sectors of the economy which, in order to address other important objectives particularly around fears of carbon leakage and lack of competitiveness (recognised as an important principle in section 2), is not a feature of the current South African carbon tax design.

By contrast, under a command and control instrument, the regulator decides how much each firm should reduce its emissions. Without excellent information on the amount and cost of emissions reduction in different parts of the economy, there is a risk that entities will be forced to reduce emissions even if it is extremely costly for them to do so (it could even lead to them exiting the market).

FIGURE 3. Market-based instruments have significantly lower cost than regulatory, command and control instruments



Note: Although the OECD study refers to emissions trading, it would be expected that a carbon tax would have a very similar or identical level of cost-effectiveness. There were no countries with examples of carbon taxes in the OECD study.

Source: OECD (2013) Effective Carbon Prices.

Looking at the other primary principles identified in this study, there are a range of other advantages of a carbon tax. These include that the revenues raised can be put to good use elsewhere in the economy in a way that can promote equity; that it is a relatively simple and transparent mechanism by which to regulate emissions (although this transparency is reduced in a system in which there are significant differences in treatment between different entities or sectors, which likely is the case in South Africa); and that entities in a similar position will be treated in a similar way (although again this advantage is somewhat reduced in the current South African design given the refinements brought into the design such as the Z factor). The carbon tax is also an instrument that provides potential new entrants with a clear understanding of how their emissions will be treated, promoting long-term efficient capital allocation and hence structural change.

The key advantage of a carbon budget is that it provides certainty over emissions. By setting a firm cap on emissions, policymakers can have confidence that emissions reductions will be delivered, assuming that the budget is effectively enforced. In the context of South Africa's commitments to the international community, this certainty is of particular value. In terms of the other principles identified for use in this study, the flexibility of setting different budgets for different entities may also make carbon budgets more sensitive to international competition than a carbon tax, as a more lenient budget might be set for firms subject to intense international competition. The same logic may also allow some targeting of budgets in a way that addresses equity concerns. In addition, setting this emissions cap at an entity level provides opportunities for policymakers to target emissions reductions from a particular source that, even if they are not the most cost effective in the short run (and so may not be delivered by a market-based instrument such as a carbon tax) are nonetheless crucial for the long-run decarbonisation of the economy.

With regards to emissions reductions effectiveness, it is not clear which instrument is superior—it depends more on the way in which the instrument is implemented rather than its intrinsic characteristics. A stringent carbon budget could deliver more emissions reductions than a carbon tax; by contrast a lax carbon budget would deliver fewer emissions reductions. There are two caveats to this:

- A carbon tax provides a continuous incentive to reduce emissions. In other words, an entity will decide for each tonne of emissions whether it is more or less costly to reduce that tonne or pay the tax. By contrast, once a firm is within the carbon budget it will face little incentive to continue to reduce its emissions and, indeed, may face a disincentive if that would lead to a more stringent budget in subsequent years.
- Some experience suggests that the lack of information possessed by a regulator will lead to it setting budgets that deliver fewer emissions reductions than a cap. This, for example, was the experience in the UK under the Climate Change Agreement/Climate Change Levy regime (Martin, Preux, & Wagner, 2009) as discussed in Annex A. On the other hand, the ability to set different budgets for different entities may allow a regulator to extract deeper emissions reductions from some entities as the stringency of the budget would only apply to that firm and would not 'spill over' to other entities in the economy who may have an ability to obstruct ambitious economy-wide policies. However, in turn, the different treatment of different entities could lead to concerns about equity and may, in the South African context, face legal challenges.

The challenge in assessing the relative emissions reduction effectiveness of both instruments is returned to in sections 5 and 6 below, as it also influences the assessment of the interface options.

The advantages and disadvantages of the carbon tax and carbon budget are summarised in Table 2.

This uses a selection of the principles identified in section 2; for other principles, it is not possible to say at this level of abstraction whether one instrument is preferable to another. Those principles especially identified by the DEA and NT are highlighted in bold. It should be stressed that these results assume the two instruments are equal in their stringency, that enforcement is equivalent across instruments and that information asymmetry is high. It is a short–medium term assessment.

TABLE 2. A comparison of the strengths and weaknesses of carbon taxes and carbon budgets

Principle	Carbon tax	Carbon budget
Emissions reduction effectiveness	?—although does provide continuous incentive to reduce emissions and the compliance mechanism used to enforce the tax (although this is well established)	?—this depends on the tightness of the budget and the compliance mechanism used to enforce the budget
Emissions certainty	**—not in the short term, although some scope to calibrate the emissions tax rate over time	***—budgets define a maximum of emissions
Cost-effectiveness	***—although somewhat reduced by having a range of different effective rates	*—unless regulator has very good understanding of the availability and costs of abatement
Polluter pays principle	***—tax, by intrinsic design, is intended to internalise environmental costs for producers and consumers; higher emissions lead to higher costs although somewhat reduced in South Africa (SA) context by different effective rates	**—entities may have to incur costs in order to meet budget; but different stringencies of budget on different firms could mean that more emissions intensive firms may not face higher costs
Equitable treatment	***—in principle all emissions are taxed and all sectors pay the same tax rate on such emissions	*—setting different budgets for different entities increases the risk that similar firms will face different costs
Distributional issues	**—through recycling tax revenues, although energy price rises may be regressive in some cases	*—unless budgets are calibrated according to the distribution of the firm’s consumers (which is difficult)
Feasibility and simplicity	**—relatively straightforward once emissions monitoring and reporting frameworks are in place	*—budget setting can be contentious and time consuming
Sensitivity to international competition	**—a carbon tax will always create additional cost on entities in international competition although tax exemptions (as proposed in SA) can reduce this impact	***—entities within budgets may not face significant cost increases and budgets can be designed to mitigate competitiveness concerns

Notes: ***—scores very well against criterion; **—scores moderately against criterion; *—scores poorly against criterion

Source: Vivid Economics, DNA Economics and Tyler.

Emissions trading systems offer an option of combining some of the advantages of the carbon price and the carbon budget. Emissions trading systems offer the prospect of emissions certainty across those companies included in the system, while the ability to trade allowances, creating a carbon price, provides the cost-effectiveness benefits of a market-based instrument. This combination has proved compelling for a number of jurisdictions ranging from the EU to California, Kazakhstan and China (see Annex A for a discussion of some of these cases). However, as discussed further below, to date, this option has not been considered feasible in the South African context.

4.2 Insights from international practice in combining mitigation policy instruments

Many countries are exploring the challenges of combining multiple emissions reduction policy instruments to reduce emissions. The insights gained from these challenges can be useful to South Africa as it considers its own options. These insights tend to consider how to combine a market-based instrument with other policies; as explained in Annex A, the practice of using budgets, especially at the firm level, is much rarer in international experience. Within this literature, where relevant, our focus is on the insights associated with integrating carbon taxes with other policy instruments; a host of different issues arise when combining carbon prices from emissions trading systems with other instruments.

It is possible to identify five key insights from relevant international experience.

1. The approach to addressing policy interactions needs to be informed by the overarching principles determining emissions reduction strategies.
2. It is broadly recognised that a package of policy instruments is needed for an effective mitigation strategy, including, but not limited to, a carbon price.
3. In any package of instruments, it is vital to be clear about the different roles of different instruments: in general, there should be no more than one policy instrument for each policy objective.
4. In packages with a carbon tax, the major integration concern is ensuring cost efficiency and avoiding policy redundancy (for an option retaining both instruments in their current form).
5. The way in which a carbon tax evolves over time is an important determinant of the long-term nature of any policy interaction.

The approach to addressing policy interactions needs to be informed by the overarching principles determining emissions reduction strategies. Different combinations, and ways to combine instruments, will be more or less appropriate depending on the policy objectives that are being sought. This supports the rationale of this report which seeks to consider the most appropriate integration based on the principles underpinning South African mitigation policy.

It is broadly recognised that a package of policy instruments is needed for an effective mitigation strategy, including, but not limited to, a carbon price. It is sometimes suggested that a carbon price alone will be sufficient to deliver necessary emissions reductions (del Rio & Labandeira, 2009). This is not backed up by more detailed analysis which recognises that a range of policy instruments, to tackle a range of barriers and market failures holding back emissions reductions, will be required. For instance, Acemoglu, Aghion, Bursztyn and Hemous (2012) find that if only an immediate carbon tax is used, it needs to be 20 times higher than in the case of the combined instruments to achieve a given target. Similarly, Fischer and Newell (2008) in a simulated model of the U.S. electricity sector find that with a combination of policies, the carbon price necessary to achieve a particular emissions reduction falls by 36 percent and the portfolio of policies generates surplus rather than costs.

In any package of instruments, it is vital to be clear about the different roles of different instruments: in general, there should be no more than one policy instrument for each policy objective. A common economics principle for policymaking is that one instrument should be used to tackle one policy challenge

(market failure). If this is not followed, then there is a risk that one of the policies will be redundant, leading to unnecessary administrative costs and wasting scarce political capital. The corollary of this principle, however, is that multiple policy objectives can support the existence of multiple policy instruments. This implies that it is important to identify the objective of each policy (or what market failure is it seeking to address).

In packages with a carbon tax, the major integration concern is ensuring cost-effectiveness and protecting against redundancy. As described above, one of the key attractions of a market-based instrument such as a carbon price is that it is typically a cost-effective way to reduce emissions. When combining multiple policy instruments, the biggest risk is that this cost-effectiveness will be reduced and/or that the tax may become redundant. This is a different set of challenges compared to a situation where other policies are being combined with a carbon price provided by an emissions trading system.

The way in which a carbon tax evolves over time is an important determinant of the long-term nature of any policy interaction. By building in flexibility to the choice of the tax rate, as envisaged in the current South African policy tax design, it is possible to avoid some of the most damaging interactions, as policy can be adjusted as the impact of these interactions become clear. On the other hand, a lack of certainty over the future tax rate may increase investment uncertainty, which is why policymakers in some jurisdictions prefer to set an up-front tax rate path, identifying how the tax rate will evolve over time.⁷ In South Africa, the Carbon Tax Policy Paper envisages an increase in the tax rate of 10 percent per annum over the first five years while reducing tax exemptions.

These insights are returned to in the context of South African policy debate in section 6.

⁷ This was the approach taken, for example, in British Columbia where an initial carbon tax of C\$10/tonne was introduced in 2008, steadily increasing to C\$30/tonne over the period to 2012.



5 Interface Options

This report considers four categories of interface options, some of which have a range of different design options, as shown in Figure 4. These options were developed by the consultancy team, drawing on international experience, and in consultation with the DEA and NT. They do not cover the full range of permutations through which the instruments might be combined but are considered to be the most plausible at present and capture (and in cases expand on) many of the options being discussed in South Africa at present. Although the carbon tax and carbon budget approach could be considered as mutually exclusive options, the terms of reference for this study have specifically requested that possible interfaces between these two instruments or approaches be considered. Hence, the merit of each of these instruments or approaches on their own is not further explored in this report. In addition, the treatment of sectors where, at present, only one instrument is expected to apply is only covered to the extent that this would need to be further addressed if it required further consideration in the detailed design of the interface option.

FIGURE 4. Four main interface options

Interface category	Interface design options
Layering: both tax and budget apply to all entities	
Tax enforces budget: combination of budgets for all firms with tax as the stick if budgets are exceeded	— which emissions are taxed if budgets are exceeded?
Hybrid: evolution into one hybrid instrument	a) ETS, trading of carbon budgets with tax determining minimum or maximum price of trade b) Baseline and credit based on <i>absolute emissions</i> , with tax determining minimum or maximum cost c) Baseline and credit based on emissions <i>intensity</i> , with tax determining minimum or maximum cost
Differential instruments: different instruments or interfaces apply to different firms or sectors	— which firms or sectors have which instrument?

Source: Vivid Economics, DNA Economics and Tyler.

- ‘**Layering**’ involves imposing both the tax and the budget on all entities that are currently expected to be regulated by each instrument, leading to a situation where many entities are subject to a budget and also have to pay a tax on all of their emissions, adjusted for any tax free allowances to which they are entitled.

- **'Tax enforces budget'** refers to a situation where a firm incurs no tax liability if its emissions are below the budget but they become liable for the carbon tax if the budget is exceeded. There are two different options:
 - if an entity exceeds its budget, it is only liable to pay the tax on the emissions in excess of the budget; and
 - if a firm exceeds its budget, then it is required to pay a tax on all of its emissions. This is qualitatively very similar to an arrangement whereby entities pay a tax on all of their emissions with these tax revenues then rebated if the emissions of the entity are below the budget.⁸
- **Hybrid:** refers to interface options where design features of each instrument are merged to form one overall instrument. We consider three different designs:
 - *An intensity-based baseline and credit scheme.* Under this mechanism, a benchmark carbon intensity is set for each sector. Entities might choose either to undertake abatement to meet their intensity threshold, or to purchase credits from other entities in the sector that have received credits from already reducing their emissions below the intensity threshold. The Canadian province of Alberta's Specified Gas Emitters Regulation (SGER) scheme requires yearly emissions intensity reductions for large emitters, with a price ceiling on the cost of emissions that exceeds the emissions intensity target.
 - *An absolute baseline and credit scheme.* This works in a similar way to the intensity-based baseline and credit scheme but the baseline is set in terms of absolute emissions. Entities comply with the baseline by choosing either to abate or to purchase credits from those already under their baselines. However, because baselines are set in the same units, tCO₂, it is easy to buy credits from any other firm that has been set a target, rather than just entities in the same sector. Tokyo has an instrument of this form.
 - *An emissions trading system.* Under this mechanism, the relevant authority imposes a limit (cap) on the total emissions in the covered sectors of the economy, and issues a number of tradable allowances that does not exceed the level of the cap. Each allowance corresponds to one unit of emissions (typically one tonne) and entities are required to surrender one allowance for every unit of emissions for which they are accountable. Entities are allowed to trade allowances between themselves and often have a number of allowances allocated for free. There are numerous examples of ETSs around the world including in the EU, California, China, Republic of Korea, and Kazakhstan. There are a number of similarities between an emissions trading system and an absolute baseline and credit scheme. For instance, in both schemes entities can purchase a right to emit a tonne of CO₂ rather than reduce their emissions. However, there are also important differences between these options, as set out further in Box 1.

In all three cases, the instruments could be combined with either a price ceiling and/or a price floor imposed through a tax arrangement. With a price ceiling, if entities consider it too costly to either reduce emissions directly or purchase credits or units, they have the option instead to pay this 'buy-out' price of tax for each tonne of emissions for which they are liable but not able to surrender an allowance or credit

⁸ These two permutations have different cashflow implications. If a tax is only paid when an entity exceeds a budget, then tax revenues are only collected once compliance when the (five-year) budget is known. If the tax is paid annually (or six-monthly) and then only rebated when the (five-year) budget is met, then the tax revenues are collected more frequently and an entity meeting its budget would only receive a rebate in the future. However, for the purposes of this analysis, they are considered equivalent.

for. Alberta's SGER caps the price by allowing entities to pay into a technology fund instead of further reducing emissions or purchasing credits on the market. A price floor might work by imposing a tax on any trading which was below the floor price, with the value of the tax being equal to the difference between the trading price and the floor price. This, for instance, is how the carbon price floor in the UK electricity sector works.

BOX 1. Differences between an ETS and an absolute baseline and credit scheme

Under an absolute baseline and credit scheme, entities are set emissions targets in tCO₂. Those that are able to reduce their emissions to levels lower than this target can sell these reductions to entities that are not able to reduce their emissions so easily.

This is very similar to an ETS in which allowances are provided to entities for free. The free allowance allocation is effectively the same as the target, with companies that reduce their emissions below the level of their free allowance allocation able to sell their excess allowances to entities who wish to increase their emissions beyond the free allowance allocation.

Indeed, an absolute baseline scheme will theoretically deliver the same emissions reductions outcomes as a cap and trade scheme at the same cost. The impact of the scheme on consumer prices should also be the same. (Wood, Blowers, & Moran, 2016)

However, it is not essential that an ETS provides allowances for free; indeed, most ETSs have over time moved to a situation where an increasing proportion of allowances are auctioned (Vivid Economics, 2015). This allows the possibility of raising revenues which can be used to offset the impact of consumer price increases, but imposes additional costs on entities. Entities may also have stronger behavioural incentives to reduce emissions when allowances are auctioned. By contrast, there is no scope to generate fiscal revenues under a baseline and credit scheme (apart from using a tax to set a price floor and ceiling).

- **Differential instrument application.** This is an interface option where different instruments are applied to different entities or sectors. The different instruments that might be considered are: a tax; a budget; one of the other integration options combining a tax or budget; or an entirely different policy instrument.



6 Option Assessment

These options are described and appraised systematically. In order to facilitate a thorough approach, we use the same five questions to guide the description. The questions are:

1. How will the interface option work?
2. What are the design features of this interface mechanism that would require a policy decision, and how is it enforced?
3. What changes would need to be made to either or both of the instruments relative to the 'assumed departure point' described in section 3.3?
4. What existing features of the 'departure point' for the carbon tax and budgets as described in section 3.3 would be preserved under this interface option?
5. Are there any international precedents similar to this option?

The section then scores for each of the options against each of the seven primary principles. This scoring focuses on the *intrinsic characteristics* of the option with no assumptions made on the stringency of the option. For example, an option which provides a continuous incentive to reduce emissions will score more highly on emissions reduction effectiveness than an option that only requires entities to meet a certain quantity of emissions. This approach reflects the fact that policymakers and stakeholders in South Africa will need to reach a decision on which interface option to proceed with before the detailed design of that interface option can be fully developed. It is important to stress that there are important and significant differences in these intrinsic characteristics of the different interface options that allow for this sort of assessment to be undertaken. It is similar, for example, to the way in which South Africa previously decided to pursue a carbon tax over an ETS on the basis of the intrinsic characteristics of those instruments in the South African context, rather than following a process of detailed design of each instrument.

However, in many cases, the way in which the interface is designed will influence how that option scores against the principle. As a clear example of this, the emissions reduction effectiveness of the 'tax enforces budget' option will depend substantially on the stringency of the budget and the tax rate that would prevail if emissions were to exceed the budget. Therefore to complement the scoring based on the intrinsic characteristics of the interface option, we describe qualitatively how the detailed design of the instrument would change the way in which the mechanism would work, and the directional impact that this would have on the scoring based on the intrinsic characteristics. This is necessarily qualitative as

it is beyond the scope of this paper to determine the precise implementation modalities for a particular interface option.⁹

Finally, the review also considers the intrinsic characteristics of the different interface options against the other principles articulated in section 2. This is done on a selective basis, highlighting where the interface option may score either relatively well against that principle or relatively weakly. This selective approach is adopted because for many of the interface options and principles there is little that can be said at this stage of the policy development process.

No attempt is made to weight the different principles. Different stakeholders are likely to attach different views to the importance of different principles: this analysis does not seek to make these value judgments, rather the intention is to help policymakers and stakeholders understand the relative strengths and weaknesses of different options, the trade-offs involved, and where these trade-offs may be most and least acute. It should be noted that ‘adding-up’ the scores that each interface option scores against each principle is equivalent to giving each principle equal weight.

6.1 Layering

	Question	Detail
1	How will the interface option work?	<p>This interface option layers the budgets and tax on top of each other and leaves the current carbon tax and budget proposal unchanged. Each instrument is applied as expected in 2021 and beyond. One option for the design of each instrument is laid out in section 3.3.</p> <p>The key implication of this interface option is that, for a particular firm at a particular point in time, only one instrument is ever binding: either the tax causes a firm to bring its emissions below the budget (in which case the budget is not relevant) or the budget causes a firm to reduce its emissions by more than it would under the tax (in which case the tax is not relevant, at least in the short term).¹⁰</p>
2	What are the design features of this interface mechanism that would require a policy decision and how is it enforced?	<p>This interface option does not economise on the policymaker decisions that need to be taken for the carbon tax and budget individually. It requires setting the:</p> <ul style="list-style-type: none"> • tax rate; • tax relief in the form of allowances; • firm specific budget; and • detailed design features of carbon budgets. <p>The enforcement mechanism for the carbon tax would likely be enforced using the Customs and Excise Act.</p> <p>The enforcement mechanism for the budget would need to be determined. International practice for enforcing environmental regulation suggests:</p> <ul style="list-style-type: none"> • levying a fine, either absolute or tied to the degree to which the budget is exceeded; • suspending and/or shutting down operations if the budget is exceeded too far or too frequently; and • imposing criminal sentences on operators.

⁹ However, in cases where the score of the instrument against the principle depends on the design features, but where, for one interface option, there is a wide set of design features that would lead the instrument to score well on the principle, while for another interface option there is a much narrower set of design features that would allow the instrument to score well on that principle, then this is reflected in the intrinsic characteristic score. For example, when comparing the tax on excess emissions when budget is exceeded with tax on all emissions if budget is exceeded then, for most tax rates and budgets, the tax on all emissions when budget is exceeded will be a more stringent penalty than the tax on emissions in excess of budget. The tax on all emissions if budget is exceeded would therefore contribute more to emissions certainty. However, mathematically, a very high tax rate on excess emissions could be a more stringent penalty than a much lower tax rate on all emissions if budget is exceeded.

¹⁰ Although in the longer term the tax may lead to dynamic incentives as the firm seeks to reduce its emissions further.

	Question	Detail
		For the purpose of this analysis, we assume that the penalty for exceeding the budget is so severe (e.g., a criminal punishment) that no entity would exceed the budget.
3	What changes would need to be made to either or both of the instruments relative to the 'assumed departure point' described in section 3.3?	None
4	What existing features of the 'departure point' for the carbon tax and budgets as described in section 3.3 would be preserved under this interface option?	All of the features of each instrument as set out in section 3.3 could be preserved.
5	Are there any international precedents similar to this option?	No obvious examples.

The scoring of this option is shown in Table 3.

TABLE 3. Layering sacrifices cost-effectiveness to achieve higher emissions reduction effectiveness

Principle	Score	Scoring notes	Sensitivity to assumptions
Emissions reduction effectiveness	●	The feature of this interface option is that the more stringent of the two instruments is also the one that determines emissions, i.e., if the tax rate is considered to be 'too low' then the budget can be set to generate greater emissions reductions while if a budget is lax, entities may still find that the tax makes it financially worthwhile to reduce emissions. For this reason, this option can be considered to be highly emissions reduction effective.	If the budget is the binding instrument then a stricter budget would further improve emissions reduction effectiveness; a higher tax rate would increase emissions reduction effectiveness if the tax rate then became the binding instrument; it would have no short-term effect if the budget remained the binding instrument. The opposite permutation would hold if the tax was initially the binding instrument.
Emissions certainty	●	Regulators can be very confident that firm emissions would either be at the level of the budget (if the budget binds) or lower than the budget (if the tax binds). The tax rate contributes little to emissions certainty in comparison with the budget.	Not affected by the stringency of either the budget or the tax.
Cost-effectiveness	○	In the event that the budget is the binding instrument, then there is a risk that this will require some entities to deliver highly cost ineffective emissions reductions. The asymmetry in the distribution of the cost of emissions reduction efforts reduces cost-effectiveness.	If the tax rate becomes higher then it is less likely that the budgets will be binding and the option will become more cost effective. Conversely, as the budgets become more stringent then the risk of cost ineffectiveness increases.

(continued)

TABLE 3. Continued

Principle	Score	Scoring notes	Sensitivity to assumptions
Polluter pays		<p>The tax and budget internalise environmental cost.</p> <p>The tax creates higher costs for higher levels of emissions for all emissions levels; budgets create additional cost by increasing the required effort to comply with the budget when emissions increase. Both, however, may generate different costs for polluters given the tax rate exemptions and the inherent variation in complying with budgets across entities.</p>	The higher the tax rate or the more stringent the budget, the greater polluters pay.
Equitable treatment		<p>Budgets pose inherent issues for equitable treatment. The average cost of adhering to a budget may vary across entities and/or sectors even if the entities and/or sectors are otherwise very similar.</p> <p>Nevertheless, the carbon tax applies—in principle—to all emissions and emitters, creating at the very least an equal minimum cost per unit of emissions.</p>	If the tax rate becomes higher then it is less likely that the budgets will be binding and the option will ensure equitable treatment. Conversely, as the budgets become more stringent then the risk of cost ineffectiveness increases.
Distributional issues		<p>This option raises predictable government revenues from all carbon emissions. This is in contrast to all other options which only raise revenues on some emissions. Moreover, the regulator retains control over the government revenue per unit of emissions (i.e., the tax rate) in contrast to options with trading. These revenues can be used to offset some of the adverse distributional implications that might otherwise arise.</p> <p>The budgets can also be designed to address adverse distributional issues by imposing more or less strict budgets on firms and/or sectors that produce goods or services disproportionately consumed by low-income groups. However, this may be difficult to achieve in practice, including due to the possibility of legal challenges, and the effectiveness of this will be limited if the tax is the binding instrument.</p>	A higher tax rate would both increase the risk of adverse distributional implications and provide additional revenues to address this risk.
Feasibility and simplicity		<p>Although this option builds on existing processes for the carbon tax and budgets, it would require the government administering both schemes and entities having to engage and report in relation to both schemes—despite the fact that for any one entity at any point in time, only one instrument would determine emissions.</p> <p>This interface option faces the risk of adversarial and tough budget negotiations as the punishment for exceeding the budget is severe.</p> <p>There would be some scope for streamlining administrative processes especially around the measuring, reporting, and verification of emissions—something identified by various South African stakeholders in the period to 2020 as well.</p>	The tighter the expected budget, the more contentious and time consuming the budget setting process will become. A higher tax rate would also have a similar effect, although it is likely to be less intrusive and time consuming.

Principle	Score	Scoring notes	Sensitivity to assumptions
Sensitivity to international competition	○	<p>A carbon tax applied to all emissions creates the largest competitiveness issues of all interface options. This may be particularly concerning in the case where an entity's emissions are constrained by the budget, i.e., the tax is not leading to a reduction in its emissions, but it is still required to pay the tax.</p> <p>Budgets in this option influence competitiveness concerns insofar as they create a cost of complying with the budget.</p>	Both the tax rate and strictness of the budget determine cost to entities and potential issues with international competition.

Source: Vivid Economics, DNA Economics and Tyler.

Layering scores very well on principles related to emissions performance but very poorly in relation to principles relating to cost-effectiveness and sensitivity to international competition. Using two instruments to reduce emissions increases emissions reduction effectiveness and certainty, as even if one instrument is relatively ineffective, the other instrument may still be effective. However, the same principle of 'double regulation' also means that the option scores poorly on some of the principles of greatest concern to the business community. This was further reinforced in the stakeholder consultation exercise where most private sector representatives considered this option to be unattractive.

In terms of the scoring against other principles important to South African mitigation policy, a number of insights, where the option scores either particularly well or particularly poorly can be made:

- the use of budgets provides those setting the budgets with an opportunity to target abatement activity in certain sectors or entities in the economy (which might be desirable for strategic reasons as discussed in the table of principles in section 2) and allows emissions reduction effort by sector to be *contextualised by other policy priorities*. For instance, laxer budgets might be set in labour intensive sectors or for firms and sectors expected to see significant employment increases. However, these benefits may not always be realised if the tax becomes the binding instrument; and
- there may be concerns over the *accountability and transparency* surrounding the setting of the budget.

6.2 Tax used to enforce the budget

Tax used to enforce the budget combines budgets and taxes by establishing a budget and requiring entities to pay a tax if the emissions exceed the budget. In effect, budgets provide the desired emissions level for entities and/or sectors and the tax is used to ensure compliance.¹¹

This interface option has two possible designs:

1. Tax emissions in excess of the budget.
2. Tax all emissions if the budget is exceeded.

For both options the same questions apply and their detail is summarised below.

	Question	Detail
1	How will the interface option work?	<p>This option assigns a budget to each firm and establishes a tax rate—which, in the first instance, acts as an enforcement mechanism—for emissions in excess of the budget. There are two options that might be considered within this option:</p> <ul style="list-style-type: none"> • If the budget is exceeded, the tax rate applies to emissions in excess of the budget • If the budget is exceeded, the tax rate applies to all emissions.
2	What are the design features of this interface mechanism that would require a policy decision and how is it enforced?	<p>This option requires setting the:</p> <ul style="list-style-type: none"> • tax rate; • budget; and • design features of carbon budgets. <p>If firms exceeded their budget then they would have to pay a tax on their emissions according to which permutation of the interface option was considered. Additional enforcement, such as fines or prosecution, would only be appropriate in the event that there were some emissions on which the entity had not paid its required tax liability according to the system's rules.</p> <p>The design of this option would also have to address the issue that the tax is expected to be paid on annual (or semi-annual) emissions while compliance against the budgets is only expected to be assessed over a five-year period.</p>

¹¹ Ideally the carbon tax and carbon budgets will be defined in a way that ensures the same entities are subject to both instruments. Ensuring alignment between instruments is a key element of the development of the Phase 2 South African Mitigation System. This alignment can be achieved by defining the coverage of the two instruments to align with that of the National Greenhouse Gas Emissions Reporting Regulations, as both instruments will rely on these regulations for reporting purposes. It is, however, possible that there may be practical or legal reasons why some entities may not be subject to both instruments. It is thus important that rules are developed to deal with cases where an entity is subject to only one of the two instruments. If an entity is subject to a carbon budget but for some reason cannot be held liable for carbon tax, an appropriate compliance mechanism will have to be developed to ensure that such an entity faces incentives to remain within its carbon budget that are as similar as possible to entities that are subject to the carbon tax. Likewise, the carbon tax rate for entities that are subject to the carbon tax, but cannot be allocated carbon budgets, could be adjusted downward to approximate the incentives they would have faced if they were allocated carbon budgets. The use of a reduced carbon tax rate would be consistent with the current carbon tax design's use of allowances, and could be set on the basis of applying an average 'carbon budget allowance' to all entities without a budget.

	Question	Detail
		<p>This may be most easily achieved by splitting the actual five-year budget into notional annual budgets and tax paid (as necessary) in relation to the annual budgets, but with year-on-year reconciliation mechanisms to allow entities to receive rebates if emissions begin to fall below the notional annual budgets after being higher than the notional annual budgets in previous years. This would require firms to have strong working capital positions. The additional fines and prosecution mechanisms would only be appropriate to use when the five-year budget period had elapsed.</p>
3	<p>What changes would need to be made to either or both of the instruments relative to the 'assumed departure point' described in section 3.2?</p>	<p>Under this interface option, the budget becomes an absolute threshold of tax-free emissions. This creates very different dynamics to a situation where the tax-free exemptions are provided as a percentage rebate on the tax rate (the current model). Under the current model all emissions attract the same (relatively modest) tax rate of between 60–95 percent of R160/tCO₂ (and rising). By contrast, with an absolute tax-free allowance, all emissions lower than the budget attract a zero tax rate and only those above the budget attract a higher tax rate. This means that entities will be able to emit up to the budget at no cost and only need to start considering whether it is cheaper to abate emissions or pay the tax when they reach the budget.</p> <p>This change in dynamics means that if the tax rate and budgets were set at the same levels as set out in section 3.3 then it would be very likely that the budgets would be exceeded. Instead, for this mechanism to be emissions reduction effective, either the tax rate would need to be higher than in the currently envisaged departure point, or the budget would need to be more stringent, or both. This would be particularly important in the case that the tax was only applied on excess emissions.</p> <p>As the tax rate is being used to enforce the budgets, then it would be less appropriate to have different tax rates for different sectors. This would be best captured in the different budgets given to entities in the first place.</p>
4	<p>What existing features of the 'departure point' for the carbon tax and budgets as described in section 3.3 would be preserved under this interface option?</p>	<p>As explained above, budgets could continue to be set on a five-year basis. There would be the same flexibility to use the revenues raised from this interface option as envisaged in section 3.3. Issues of which sectors to regulate could be made independently of whether policymakers adopted this interface option.</p>
5	<p>Are there any international precedents similar to this option?</p>	<p>None</p>

The dynamics created by this mechanism depend on whether only those emissions in excess of the budget are taxed or whether, if the budget is exceeded, all emissions are taxed. We therefore score these options separately, with the option of budget with tax on emissions in excess of budget in Table 4.

TABLE 4. Budget with tax on emissions in excess of budget

Principle	Score	Scoring notes	Sensitivity to assumptions
Emissions reduction effectiveness		Entities have no incentive to reduce emissions below the budget, in contrast to options that allow trading of emissions. As such, this option, together with the other option in this category, <i>budget with tax on all emissions if budget is exceeded</i> , scores poorly compared to other interface options.	The score depends heavily on the level of the budget and tax rate. If the budgets are strict and/or the tax rate is set at a high level, the mechanism would become more effective (although in most cases still lower than for <i>budget with tax on all emissions if budget is exceeded</i>). However, even with a more stringent budget and tax rate there would still be no incentive for entities to reduce emissions below the budget.
Emissions certainty		Budgets provide certainty on individual firm emissions levels. However, as there is an explicit mechanism to tax emissions above the budget, this fails to ensure an economy-wide emissions budget.	The higher the tax rate on emissions above the budget, the more confident policymakers can be that entities will stay within their budgets. The more stringent the budget, the more likely it is that firms will choose to pay the tax to exceed the budget, reducing certainty.
Cost-effectiveness		Costs are limited by the tax and increase cost-effectiveness—abatement options that are more expensive than the tax rate will not be undertaken. Cost-effectiveness will be lower than for options allowing for trading of emissions: entities within budgets will have no incentive to tap low cost emissions reduction opportunities.	If the budget declined over time, with the carbon tax becoming the primary instrument, the mechanism would more cost effective (especially if the same rate was used across all sectors of the economy).
Polluter pays		The budget internalises environmental cost, as does the tax on emissions above the budget. Budgets create additional cost by increasing the required effort to comply with the budget when emissions increase. It may, however, generate different costs for polluters given the inherent variation in complying with budgets across entities. When the budgets are exceeded, polluters pay for additional emissions.	The ambition of the budget and the tax rate for excess emissions influences the extent to which polluters pay: laxer budgets or lower tax rates reduce the extent to which polluters pay. If no effort is needed to stay within budget then the polluter does not pay.
Equitable treatment		The budget negotiation will determine the degree of equitable treatment with the possibility that (average and marginal) costs may vary significantly within sectors, even for entities that are otherwise quite similar. In part, this process is in trade-off with distributional issues where entities producing goods heavily consumed by low-income households can receive laxer budgets to help limit cost increases, although the difficulties associated with differentiating budgets on this basis would continue to apply.	The score depends heavily on the strictness of budgets across and within sectors. Regardless, the average cost per emissions reduction will vary as, even within homogenous sectors such as cement, the cost of emissions reduction varies between facilities without a possibility to equalise cost, i.e., via trading. If the proportion of emissions covered by the budget declined over time, with the carbon tax becoming the primary instrument, the mechanism would provide more equitable treatment.

Principle	Score	Scoring notes	Sensitivity to assumptions
Distributional issues		<p>Unlikely to raise much revenue in the first instance as budgets need to be exceeded for the tax to create revenue.</p> <p>Entities within budgets face implicit costs of reducing emissions. Although these costs are limited by the carbon tax rate, they are likely to be reflected in product prices as part of the costs are passed through to consumers. However, there is some scope to set different budgets for different entities to take account of whether they produce goods and services disproportionately consumed by more vulnerable households, although the difficulties associated with differentiating budgets on this basis would continue to apply.</p>	<p>If the tax becomes the primary instrument by continually tightening budgets, the scope for raising revenue increases. This would provide increased opportunities to use these revenues to support poor and vulnerable households. However, this would also make it more difficult to treat different sectors differently depending on whether they produce goods and services disproportionately consumed by more vulnerable households.</p>
Feasibility and simplicity		<p>This option builds on existing processes for the budget and tax. The addition to only tax emissions above a certain level does not materially increase the difficulty in administering this option for government or entities.</p>	N/A
Sensitivity to international competition		<p>Entities within budgets have lower average costs than the tax rate. Budgets provide the flexibility to reduce costs for sectors facing intense international competition by giving them higher budgets.</p>	<p>The tax rate applied to emissions and the strictness of the budget greatly influence this. A lax budget and/or reduced rate for sectors in international competition lowers costs and alleviates concerns.</p>

Source: Vivid Economics, DNA Economics and Tyler.

Overall, when comparing this option against the seven key principles, it scores particularly well for feasibility and simplicity and sensitivity to international competition but may be less effective at effectively reducing emissions or providing emissions reduction certainty. This suggests it may be most appropriate as an interim option for aligning the two instruments, rather than as a complete solution. This idea is returned to in the conclusions.

A number of other principles important to South African mitigation policy are also germane to this option:

- budgets may face concerns over the *accountability and transparency* of setting the budget; and
- budgets allow policymaker flexibility and a strategic approach that promotes structural transformation.

Table 5 provides the assessment of the closely related option of budget with tax on all emissions if budget is exceeded.

TABLE 5. Budget with tax on all emissions if budget is exceeded scores particularly poorly on cost-effectiveness

Principle	Score	Scoring notes	Sensitivity to assumptions
Emissions reduction effectiveness		The effectiveness is similar to the <i>budget with tax on emissions in excess of budget</i> option as entities have no incentive to reduce emissions below the budget.	It depends heavily on the level of the budget and tax rate. With budgets set at closer to BAU, entities would face little or no incentive to reduce emissions. However, with costs if the budget is exceeded likely to rise more than in the case when the tax is only applied on excess emissions, entities are more likely to stay within the budget. If the budget covers an increasingly small proportion of each firm's emissions, and the tax rate was set at a high level, then the mechanism would become more effective.
Emissions certainty		This design likely scores better than the <i>budget with tax on excess emissions</i> because the financial penalty for exceeding the budget occurs with a jump at the budget point, providing a strong incentive to stay inside the budget.	A higher tax rate increases emissions certainty, whereas the budget does not influence certainty.
Cost-effectiveness		<p>The cost-effectiveness is lower than if only emissions above the budget are taxed. As entities approach the budget they may take up high cost abatement to avoid paying the tax on all emissions. This reduces cost-effectiveness, in particular if the budgets are harder to achieve for some entities within a sector or across sectors.</p> <p>In addition, cost-effectiveness will be lower than for options allowing for trading of emissions. Entities within budgets may have untapped relatively low cost emissions reductions opportunities that would not be captured.</p>	In conjunction with setting budgets that do not equalise the marginal cost of abatement across emissions, the higher the tax rate, the more likely it is that some entities will have to take up high cost abatement while low cost abatement remains untapped elsewhere in the economy.
Polluter pays		<p>The budget internalises environmental cost, as does the tax on emissions above the budget. Budgets create additional cost by increasing the required effort to comply with the budget when emissions increase. It may, however, generate different costs for polluters given the inherent variation in complying with budgets across entities. When the budgets are exceeded, polluters pay for additional emissions, in this case a much higher amount than under the previous option.</p>	The ambition of the budget and the tax rate for excess emissions influences the extent to which polluters pay: laxer budgets or lower tax rates reduce the extent to which polluters pay. If no effort is needed to stay within budget then the polluter does not pay.
Equitable treatment		Although similar to <i>budget with tax on emissions in excess of budget</i> , the highly uneven distribution of costs if budgets are exceeded results in a lower score.	<p>Unless budgets are lax enough that no firm is exceeding theirs, costs will remain highly unevenly distributed.</p> <p>A higher tax rate increases the risk of a more uneven distribution of cost, and vice versa.</p>

Principle	Score	Scoring notes	Sensitivity to assumptions
Distributional issues		<p>Similarly to <i>budget with tax on emissions in excess of budget</i>, entities with stringent budgets will pass the cost of meeting the budget through to consumers. However, there is some scope to set different budgets for different entities to take account of whether they produce goods and services disproportionately consumed by more vulnerable households.</p> <p>This approach is unlikely to raise much revenue, reducing public resources that might be made available to address price increases and distributional concerns.</p>	If the tax becomes the primary instrument by continually tightening budgets, the scope for raising revenue to address distributional issues increases.
Feasibility and simplicity		This option builds on existing processes for the budget and tax. The addition of applying the tax on all emissions if the budget is exceeded does not materially increase the difficulty in administering this option for government or entities.	N/A
Sensitivity to international competition		Although budgets provide the flexibility to reduce costs for sectors in international competition, the high cost created when budgets are exceeded is likely to increase competitiveness concerns compared with only taxing emissions in excess of the budget.	The tax rate applied to emissions and the strictness of the budget greatly influence this. A lax budget for sectors facing international competition would alleviate these concerns.

Source: Vivid Economics, DNA Economics and Tyler.

Compared to the tax applying on excess emissions, this option creates greater emissions certainty but is less cost effective. It may also add to concerns about how budgets are set and the possibility of inequitable treatment, as well as its potential competitiveness impacts.

6.3 Hybrid instruments with trading

The hybrid instruments introduce the concept of trading, either across the economy (emissions trading system or baseline and credit with absolute emissions threshold) or within sectors (baseline and credit with intensity thresholds). As laid out in section 4.1, trading potentially provides a way of combining emissions certainty with cost-effectiveness. In these options, the carbon tax would be used as a price floor and/or ceiling to moderate some of the price volatility that may otherwise be created by trading options.

A key issue with any approach involving trading is the emissions concentration in South Africa, where a very substantial proportion of emissions are associated with two entities: Sasol and Eskom. This raises the concern that one or either of these companies may be able to either abuse a dominant position in the market for trading allowances, distorting the effectiveness of the trading market or allowing them to use their position in the trading market to affect the ability of other suppliers to compete to provide the same products as these firms. In addition, relatively small proportional changes in the demand or supply of allowances from these entities could have a very significant impact on the liquidity of the market for other participants. Box 2 discusses some of the options that may be available to address these concerns. It should also be noted that if trading options are combined with price floors and/or ceilings, as proposed, then some of these potentially damaging implications would be alleviated.

BOX 2. Options to facilitate trading given emissions concentration in the South African economy

There are a number of options that might be considered:

1. Subject Eskom and/or Sasol to a different regulatory instrument where there is no trading. This is discussed further in section 6.4.
2. Place a limitation on the extent to which trading options can be used for compliance purposes. For instance, one or both of these entities may not be able to purchase or sell allowances equal to more than a certain percentage of their starting year emissions. This could be applied under a baseline and credit (absolute and intensity) and an ETS with free allowance allocation. It would not be feasible in situations where there was an ETS where these entities did not receive allowances for free.
3. Increase the availability of offsets by accepting some international credits. At present the design of the carbon tax allows for regulated entities to meet a proportion of their tax obligation by surrendering domestically generated offset credits. In cases where the involvement of Sasol and Eskom is expected to only create challenges because of their large demand for credits, it may be possible to liberalise the rules on offset generation so that some of this demand could be met through the supply of international credits. This would not be a solution where there was a concern that these companies were likely to be net suppliers to the market.
4. International linking. In the case of a full ETS, there may be scope for linking the South African ETS with one or more ETSs in other jurisdictions such that the combined influence of Sasol and Eskom is much smaller. This would require significant efforts to secure regulatory harmonisation with the other jurisdiction(s) and is only likely to be feasible over a longer time horizon, well beyond 2021.

6.3.1 Emissions trading system with tax as the floor and/or ceiling price

	Question	Detail
1	How will the interface option work?	<p>In an emissions trading system, the total amount of capped emissions, typically calculated by reference to the overall emission reduction commitment of the country, is converted into an equivalent amount of allowances that can then be freely traded across and within all sectors. Typically, some proportion of these allowances are freely allocated to entities, to reduce the absolute cost increase they face. Budgets would form the free allocation of allowances for each entity. Different entities or sectors might receive a different proportion of free allowances based on their characteristics, such as trade exposure, share of process emissions, or observed cost pass-through rates.</p> <p>The tax can be used as a floor and/or a ceiling for the price of traded emissions. Used as a price floor, it can ensure efficient long-term capital allocation and avoid lock-in to carbon intensive capital stocks; used as a ceiling, it can limit the potential impacts on competitiveness high costs may create. Such price ceilings and floors are already in place in the UK¹² and California.</p>

¹² UK: The Carbon Price Floor acts as an explicit floor price of the EU ETS in the UK and the EU ETS Market Stability Reserve may provide a 'soft' price ceiling, releasing additional emissions allowances if prices increase beyond a threshold.

CA: An auction reserve price of almost US\$11/tCO₂ determines the price floor and the Allowance Price Containment Reserve releases certain amounts of emissions allowances at predetermined prices (>US\$40).

	Question	Detail
2	What are the design features of this interface mechanism that would require a policy decision and how is it enforced?	<p>This option requires setting a number of different variables including the:</p> <ul style="list-style-type: none"> • overall cap; • budget, which becomes the free allowance allocation allocated to either entities; and • tax rates, which evolve into a floor and/or ceiling price. <p>A detailed system of monitoring, reporting, and verification would be needed to ensure that entities surrendered allowances in line with their emissions. If the tax was used as a price ceiling, this would help with enforcement as entities could elect to pay the tax for some emissions. However, additional sanctions, such as the need to ‘make good’ any emissions for which allowances have not been surrendered or a tax paid, would need to be introduced.</p>
3	What changes would need to be made to either or both of the instruments relative to the ‘assumed departure point’ described in section 3.2?	<p>There would need to be significant changes to both instruments.</p> <p>There would be a need to decide on the total emissions under the cap and then the proportion of emissions that would be given to firms for free (this free allocation being equivalent to the budget for that entity). The current considerations that influence the tax rate faced by each entity would be expected to instead influence the proportion of free allowances each entity received, implying that additional factors would need to be taken into account in the budget setting process.</p> <p>The tax rate would also need to be modified to set the floor and/or ceiling for the trading price of emissions. These are likely to require different rates from those currently used for the tax. It would also not be appropriate to use different tax rates for different entities. The tax rate would need to be set over the same time period as surrender obligations in the ETS were measured.</p>
4	What existing features of the carbon tax and budgets would be preserved under this interface option? Which might not be compatible with the interface option?	<p>Budgets could continue to be set for a five-year period. The current arrangements which allow entities to use offsets against their tax obligation would only need to be modestly revised to allow entities to instead use offsets against their obligations to surrender allowances.</p>
5	Are there any international precedents similar to this option?	<p>There are a wide number of emissions trading systems around the world, including ones which incorporate price floors and/or ceilings, such as in California.</p>

TABLE 6. ETS with price floor and/or ceiling scores well on emissions reduction effectiveness, certainty, and cost-effectiveness but generates potentially less revenue than other interface options to increase fairness and equity

Principle	Score	Scoring notes	Sensitivity to assumptions
Emissions reduction effectiveness	●	<p>Emissions trading encourages the take-up of additional emissions reductions below budgets, as these emissions reductions can be traded. This has the potentially highest emissions reduction effectiveness of all options as the ETS could cover all sectors of the economy.</p> <p>A price floor can increase the effectiveness in cases where market dynamics might otherwise lead to a price that is considered too low to drive long-term low-carbon investment. A price ceiling, conversely, limits emissions reduction effectiveness if it is set too low.</p>	<p>Emissions reduction effectiveness is primarily determined by the overall cap; the free allocation rate (budgets) should not influence emissions reduction effectiveness, although if allowances continue to be provided for free over multiple periods then entities may be reluctant to reduce emissions.</p> <p>The higher the price floor the more effective the scheme will be at encouraging long-term low-carbon investment; the lower the price ceiling the less effective will be the scheme at encouraging emissions reductions.</p>

(continued)

TABLE 6. Continued

Principle	Score	Scoring notes	Sensitivity to assumptions
Emissions certainty		<p>Emissions certainty is supported by the emissions cap, which is set by the national emissions targets.</p> <p>A price ceiling, which provides entities with an alternative to reducing emissions if allowance prices rise too high, reduces emissions certainty.</p>	<p>The lower the price ceiling, the less certain are emissions reductions.</p> <p>Allowing international offsets would reduce the emissions reductions delivered domestically.</p>
Cost-effectiveness		<p>Cost-effectiveness is potentially greatest of all interface options as it allows the take-up of lowest cost emissions reductions across all sectors due to trading of emissions.</p>	<p>A price floor may reduce the cost-effectiveness as it may keep prices higher than is needed in order to meet the cap.</p> <p>The rate of free allocation should not influence cost-effectiveness as all low-cost emissions abatement will still be taken up due to trading across all sectors in the ETS.</p>
Polluter pays		<p>An ETS internalises environmental costs. Higher emissions result in higher cost for polluters because either allowances have to be purchased or the entity has to surrender allowances it could have otherwise sold.</p> <p>The score is slightly reduced as free allocation means that while entities face an opportunity cost from emitting (the revenue that they could have generated by selling the allowances), they need not face a direct financial cost. Indeed, in some cases entities have made windfall profits from a combination of free allowance allocation and cost pass-through.</p>	<p>The presence and design of free allocation influences whether some polluters do not need to pay for emissions. While full auctioning of emissions allowances always leads to polluters paying, this need not be the case with free allowance allocation. Free allowance allocation can also lead to the average cost of emissions differing between entities.</p>
Equitable treatment		<p>Each entity has a compliance obligation that is strictly proportional to its emissions. This promotes equitable treatment as firms with similar emissions have similar obligations.</p> <p>However, the free allocation (budget) negotiation will determine the degree of equitable treatment.</p> <p>This interface option preserves the possibility to auction off all allocations, in which case the average cost per unit of CO₂ is equal across and within sectors, treating all entities equally.</p> <p>Large emitters may be able to use their dominant position in the allowance market in an anticompetitive way.</p>	<p>The score depends heavily on the degree of free allocations across and within sectors. Different free allocations result in very different lump-sum transfers to entities across and within sectors.</p>

Principle	Score	Scoring notes	Sensitivity to assumptions
Distributional issues		<p>The option does not generate government revenue on free allowances, only when emissions are auctioned by the government. The revenue stream itself is uncertain as the price of emissions is market based and can vary, as well as the demand for government-auctioned emissions allowances.</p> <p>Free allowances (budgets) can be used to lessen the cost impact on entities producing goods disproportionately consumed by low income households, although the precise mechanics by which these are allocated will determine the impact on consumer prices.</p> <p>This interface option has the possibility to auction off allowances and generate government revenue to lessen distributional impacts, in contrast to a baseline and credit scheme.</p>	<p>The emissions allowance allocation rate and method determine how much revenues are raised to offset potential distributional issues. Lower free allocation rates, i.e., more auctioning, increases the revenues that can be made available to address distributional issues.</p>
Feasibility and simplicity		<p>This option, as all three hybrid options, is considerably more complex. It requires a lot of new processes including emissions registries as well as mechanisms to decide on the allocation of allowances.</p>	<p>The addition of a price floor or ceiling increases the feasibility challenges of this option.</p> <p>Finding ways to accommodate the dominance of Eskom and Sasol, such as by international linking, would make the system even more complicated.</p>
Sensitivity to international competition		<p>In contrast to other options, the market price, price ceiling and/or price floor are the same across and within sectors, providing less scope to adjust these to alleviate competitiveness concerns.</p> <p>However, in principle and in practice, this option can be designed to alleviate competitiveness concerns. Free allowances allow for sufficient flexibility to adjust costs for entities to match those in other jurisdictions in which these sectors compete (or, more frequently, eliminate or minimise costs for such sectors). For example, the EU ETS has historically provided and continues to provide a much higher free allocation rate to sectors deemed at risk of carbon leakage, i.e., in international competition with entities in jurisdictions without or with lower carbon prices. However, this requires careful and frequent assessment of free allocations to avoid under- as well as over-allocation.</p>	<p>The free allocation rate and method of allowances will determine how sensitive the interface option is to international competition.</p>

Source: Vivid Economics, DNA Economics and Tyler.

An ETS, with price floor or ceiling, performs well on many of the primary principles, including emissions reduction effectiveness and certainty, as well as cost-effectiveness, but faces important practical implementation challenges in South Africa. Previous analysis suggests that it may be very difficult to accommodate Sasol and/or Eskom given their dominant position in South Africa's emissions profile. This suggests it may only be feasible in cases where there are differential instruments applied to these companies or in the medium–longer term when there is greater scope for these issues to be addressed.

6.3.2 Baseline and credit

Baseline and credit schemes establish a benchmark level of emissions or emissions intensity for different entities. Entities with an emissions performance better (lower) than the benchmark can trade this good performance with entities that exceed their benchmark. The benchmark may be set either on an absolute emissions basis or on an intensity basis (such as tCO₂ per tonne of product). As discussed in Box 1, an absolute baseline and credit scheme performs in the same way as an emissions trading system in which all allowances are grandfathered (in perpetuity). By contrast, in the option where intensity benchmarks are used, trading will be restricted to entities in the same sector. In addition, entities exceeding their benchmark may opt to pay a fee (tax) rather than trade with good performers. Because this option makes use of trading, it faces many of the same challenges in the South African context as an ETS.

	Question	Detail
1	How will the interface option work?	<p>This option establishes a benchmark of emissions for entities, which either is an <i>absolute emissions</i> or <i>emissions intensity</i> benchmark. Entities must make sure that they meet the allotted benchmark—either by reducing their emissions or by the purchasing 'budget' from entities that have reduced their emissions below the benchmark.</p> <p>The carbon tax can, as for the emissions trading system interface option, play a role as a floor and/or ceiling price for emissions. Similarly, the ceiling price may create government revenue by being a fee paid to the government to avoid purchasing emissions certificates at a market price higher than the fee.</p>
2	What are the design features of this interface mechanism that would require a policy decision and how is it enforced?	<p>This option requires setting the:</p> <ul style="list-style-type: none"> • benchmarks on either an absolute emissions or emissions intensity basis; and • tax rates, which evolve into a floor and/or ceiling price. <p>As with the options where the tax is levied in the event that the budget is exceeded, compliance measures (such as fines or criminal sanctions) would only apply in the event that not all of the tax on the emissions that attracted the tax liability would be paid.</p>
3	What changes would need to be made to either or both of the instruments relative to the 'assumed departure point' described in section 3.3?	<p>Existing budgets could be used to inform <i>absolute emissions benchmarks</i> adjusted downwards for South Africa's national targets. These could be set for five years as currently envisaged. Facilitating trading of these budgets would be a step change from current processes.</p> <p>An emissions intensity benchmark would require greater change in the budget setting process, although it could be linked to the current Z factor within the carbon tax design for each sector and expanded to cover more sectors.</p> <p>The tax rate would also need to be modified to set the floor and/or ceiling for the trading price of emissions. These are likely to require different rates from those currently used for the tax. It would also not be appropriate to use different tax rates for different entities. The tax rate would need to be set over the same time period as surrender obligations in the ETS were measured.</p>

	Question	Detail
4	What existing features of the 'departure point' for the carbon tax and budgets as described in section 3.3 would be preserved under this interface option?	Budgets could continue to be set for a five-year period. The current arrangements which allow entities to use offsets against their tax obligation would only need to be modestly revised to allow entities to instead use offsets against their obligations to surrender allowances.
5	Are there any international precedents similar to this option?	Alberta Specified Gas Emitters Regulation currently uses an emissions intensity baseline and credit scheme, although it is discussing moving to a carbon tax. Tokyo uses an absolute baseline and credit scheme.

The dynamics created by the absolute baseline and credit option are described in Table 7.

TABLE 7. Absolute emissions baseline and credit achieves a similar score to an emissions trading system

Principle	Score	Scoring notes	Sensitivity to assumptions
Emissions reduction effectiveness		<p>This interface option design scores well because entities face a continuous incentive to reduce emissions, as these reductions can be sold to others who have more difficulty reducing emissions.</p> <p>A price ceiling may reduce the emissions reduction effectiveness whereas a price floor encourages continued emissions reduction up to the floor price.</p> <p>This option scores lower than the ETS as the incentive to further reduce emissions may be less strong than under auctioning of free allocations in an ETS.</p>	<p>Setting tighter or more lax budgets for each entity improves/reduces the effectiveness of reducing emissions.</p> <p>The higher the price floor the more effective the scheme will be at encouraging long-term low-carbon investment; the lower the price ceiling the less effective will be the scheme at encouraging emissions reductions.</p>
Emissions certainty		<p>The sum of the budgets set for each entity determines the total emissions allowed under the system, and so should provide for strong emissions certainty.</p> <p>However, entities may elect to pay the tax—a ceiling price—rather than reach the benchmark. This reduces emissions certainty.</p>	<p>The lower the price ceiling, the less certain are emissions reductions.</p> <p>Allowing international offsets would reduce the emissions reductions delivered domestically.</p>
Cost-effectiveness		<p>Trading encourages cost-effectiveness and is in principle similar to an ETS.</p>	<p>The higher the price floor, the more (short-term) cost effectiveness may be reduced (in trade-off with increasing long-term emissions reduction effectiveness).</p> <p>The benchmark does not influence cost effectiveness as all low-cost emissions abatement should be taken up due to trading across all sectors in this scheme.</p>

(continued)

TABLE 7. Continued

Principle	Score	Scoring notes	Sensitivity to assumptions
Polluter pays		<p>A baseline and credit scheme internalises environmental costs.</p> <p>Higher emissions result in higher cost for polluters because either allowances have to be purchased or the entity has to surrender an emissions certificate it could have otherwise sold.</p> <p>However, as the absolute baseline and credit resembles an ETS with free allowance allocation then, as has been observed in other ETSs, it is possible for entities to make windfall profits.</p>	The tighter the budget is set, the more likely it is that polluters will pay.
Equitable treatment		<p>The cost burden faced by any individual entity is strongly influenced by the negotiation of its budget. This opens up the possibility that similar entities will be treated differently depending on the success of their negotiation.</p> <p>Large emitters may be able to use their dominant position in the trading of budgets in an anticompetitive way.</p>	The score depends heavily on the absolute benchmarks agreed for each entity.
Distributional issues		<p>The sectoral benchmarks can—in principle—accommodate exemptions to reduce the cost impact on low-income households.</p> <p>Revenue generation of this scheme is low: government revenues would only be generated through entities that choose to pay the tax/fee rather than reaching the benchmark, which, depending on the stringency of the benchmark, may not raise much revenue.</p>	<p>The benchmarks may create or lessen distributional issues, such as whether sectors producing goods mainly consumed by low-income households have higher or lower free allocation rates.</p> <p>The ceiling price in combination with the benchmarks determines the potential to raise government revenue to lessen distributional impacts.</p>
Feasibility and simplicity		This option, as all three hybrid options, is relatively complex. It requires creating the infrastructure to allow trading while maintaining the core of existing processes of the budget (including the negotiation process) and tax. It is less onerous than an ETS as issues around auctioning do not need to be addressed.	The addition of a price floor and/or ceiling may increase the difficulty of this option as it requires careful calibration.
Sensitivity to international competition		<p>This option only imposes costs on entities to the extent that they need to purchase budget because their emissions are above the benchmark.</p> <p>Benchmarks can also be adjusted to take account of relative exposure to international competition.</p>	The tighter the budgets are set, the more there is a risk of competitiveness concerns.

Source: Vivid Economics, DNA Economics and Tyler.

An absolute baseline and credit scores similarly to an ETS. It performs as well, or almost as well, as an ETS on emissions reduction and cost-effectiveness and emissions certainty; the key differences that arise are that it may be slightly more feasible to implement and that, as it does not raise government revenue, it scores less well on equitable treatment but better on sensitivity to international competition.

TABLE 8. Emissions intensity baseline and credit scores lower than ETS and absolute baseline and credit by restricting emissions trading to within-sector instead of allowing economy-wide trading

Principle	Score	Scoring notes	Sensitivity to assumptions
Emissions reduction effectiveness		<p>This interface option design scores well because entities face a continuous incentive to reduce emissions, as these reductions can be sold to others who have more difficulty reducing emissions.</p> <p>This option scores lower than the ETS as the incentive to further reduce emissions may be less strong than under auctioning of free allocations in an ETS.</p>	<p>The benchmark is the main determinant of emissions reduction effectiveness: a tighter benchmark increases the score, A (lower) price ceiling reduces emissions reduction effectiveness, whereas a (higher) price floor increases it.</p>
Emissions certainty		Absolute emissions of the sector may vary and not necessarily conform to the national targets.	N/A
Cost-effectiveness		<p>Trading encourages cost-effectiveness. However, in this option trading is limited to entities within the same sector, limiting the cost-effectiveness benefits from trading</p>	<p>A price floor may reduce the cost-effectiveness in trade-off with increasing emissions reduction effectiveness.</p> <p>The choice of the intensity benchmark should not influence cost-effectiveness as all low-cost emissions abatement should still be taken up due to trading across all sectors in this scheme. However, the free allocation influences cost to entities and equitable treatment (see below).</p>
Polluter pays		<p>A baseline and credit scheme internalises environmental costs.</p> <p>Higher emissions result in higher cost for polluters because either emissions allowances have to be purchased or the entity has to surrender emissions allowances it could have otherwise sold.</p> <p>However, as with an absolute baseline and credit, there is the possibility of windfall profits as some entities may increase prices despite, effectively, receiving allowances for free.</p>	The tighter the intensity benchmark is set, the more likely it is that polluters will pay.
Equitable treatment		The benchmark negotiation will determine the degree of equitable treatment. The use of a common benchmark within a sector should reduce the risk of inequitable treatment as all entities in a sector will face the same benchmark. However, this may be less valid in cases where the emissions intensity of different entities in a sector varies significantly for idiosyncratic reasons (as may well be the case in some sectors in South Africa).	The score depends heavily on the emissions intensity benchmarks set for each sector and to what extent entities in sectors have emissions intensities that differ significantly due to uncontrollable factors.

(continued)

TABLE 8. Continued

Principle	Score	Scoring notes	Sensitivity to assumptions
Distributional issues		<p>The sectoral benchmarks can—in principle—accommodate exemptions to reduce the cost impact on low-income households. In practice, this may be challenging.</p> <p>Nevertheless, revenue generation of this scheme is low: government revenues would only be generated through entities that choose to pay the tax/fee rather than reaching the benchmark, which, depending on the stringency of the benchmark, may not raise much revenue.</p>	<p>The benchmarks may create or lessen distributional issues, such as whether sectors and/or entities producing goods mainly consumed by low-income households have higher or lower benchmarks.</p> <p>The price ceiling in conjunction with the intensity benchmarks determines the potential to raise revenues.</p>
Feasibility and simplicity		<p>This option, as are all three hybrid options, is relatively complex. It requires the development of the infrastructure for trading while maintaining the core of existing processes of the budget and tax.</p> <p>An additional difficulty is the tracking of production to calculate emissions intensity. This requires additional effort to benchmark entities and track and report production every accounting period. The initial calculation of the benchmark may be a particular challenge in South Africa where in a number of sectors there are only a small number of entities.</p>	<p>The addition of a price floor or ceiling increases the difficulty of this option.</p>
Sensitivity to international competition		<p>In principle and in practice, this option can be designed to alleviate competitiveness concerns.</p> <p>In particular, the intensity benchmark facilitates expansion in output without creating emissions constraints.</p> <p>In addition, this option only imposes costs on entities to the extent that they need to purchase budget because their emissions are above the benchmark. Benchmarks can also be adjusted to take account of relative exposure to international competition.</p>	<p>The benchmark will determine the cost to sectors in international competition with similar issues and options as for the absolute emissions baseline and credit scheme.</p>

The intensity baseline and credit mechanism scores particularly well on sensitivity to international competition but poorly on emissions certainty. It could also be challenging to implement in the current South African context.

6.4 Differentiated instruments

The final category of options works by subjecting emissions from different sources to different forms of regulation. This is a relatively common approach to potential overlap in other jurisdictions. Annex A demonstrates that, for example, both Switzerland and France, among others, have explicitly introduced different instruments to reflect the different characteristics of emissions sources in different parts of their economy. It should be stressed that this option does not equate to exempting certain sources of emissions from regulation, just applying different regulatory instruments to them.

	Question	Detail
1	How will the interface option work?	This interface option involves using different instruments for different entities in the economy. Each entity would only be regulated by one instrument, but that instrument would differ across different entities or, more likely, sectors.
2	What are the design features of this interface mechanism that would require a policy decision and how is it enforced?	<p>The key issues associated with this interface option are to decide which instrument should apply to which entities. There are a very wide number of different permutations possible but the most important policy instrument options are:</p> <ul style="list-style-type: none"> • a carbon tax; • a carbon budget; • one of the other interface options that seek to combine aspects of the budget and tax; and • an entirely different instrument. <p>Once different instruments had been assigned to different entities in the economy, it would still be necessary to reach decisions on the design of each of these instruments i.e., the tax rate for those entities regulated by the tax, the budget for those entities regulated through a budget, or the interface features if some entities are regulated by one of the other interface options identified above.</p> <p>For entities regulated by the tax or budget in isolation, enforcement would follow the current intended approach. For entities regulated by one of the interface options, enforcement would need to follow the approach described in the table explaining that interface option.</p>
3	What changes would need to be made to either or both of the instruments relative to the 'assumed departure point' described in section 3.3?	<p>The current expected design of the carbon tax and budget beyond 2020, as set out in section 3.3, would continue to operate in relation to some entities or sectors of the economy. However, the range of entities covered by that instrument would be narrowed.</p> <p>If some entities were regulated by one of the interface options discussed elsewhere in the paper, then the tax and/or budget would need to be amended along the lines discussed in the relevant table elsewhere in this report.</p>
4	What existing features of the carbon tax and budgets would be preserved under this interface option? Which might not be compatible with the interface option?	The current expected design of the carbon tax and budget beyond 2020, as set out in section 3.3, would continue to operate in relation to some entities or sectors of the economy. However, the range of entities covered by that instrument would be narrowed.
5	Are there any international precedents similar to this option?	This is one of the commonest ways in which other economies integrate different mitigation policy instruments. For example, in France, some emissions are regulated by the EU ETS, emissions not subject to the EU ETS are subject to a carbon tax, and sectoral level carbon budgets exist for sectors outside the EU ETS. Similarly, Switzerland allows emissions from smaller entities to be regulated by a voluntary agreement.

It is not possible to assess this interface option using the same scoring metrics as for the other options. This is due to the large number of different permutations that it provides; different permutations of instruments on different entities would be either more or less attractive on different criteria. Instead, we therefore explore the general strengths and weaknesses of this approach, and then consider some of the most obvious cases where this approach might be applied in the South African economy and the issues that this raises.

The general attraction of this interface option is that it is a transparent solution that avoids any of the distortions and economic/political economic challenges that can arise from layering (see section 6.1).¹³

¹³ In addition to the intrinsic advantages associated with the use of each individual instrument in a particular context, i.e., that carbon taxes are cost-effective, carbon budgets provide emissions certainty.

It is also an approach that allows consistency with the international principle discussed in section 4.2 that different policy instruments should ideally be used in cases where there are different barriers or market failures that need to be overcome: for reasons of cost-effectiveness, a carbon tax might be used in cases where the primary barrier to emissions reductions is the lack of commercial incentive; or budgets might be used in cases where non-price barriers are the more important explanation for holding back mitigation or where a targeted approach is desired to drive emissions reductions that may not be cost effective in the short run (and so may not be realised by a carbon tax) but which are seen as necessary for the long-term decarbonisation of the economy. The attractions of this interface option are reflected in the number of different countries who integrate different mitigation policy instruments by using different instruments for different emissions.

The downside of this interface option¹⁴ is that different instruments for different emissions will impose different costs across the South African economy, both raising the aggregate cost of meeting its emissions reduction targets, as well as the possibility of creating competitive distortions. For example, one firm or sector may complain that it is unfairly penalised because it is being regulated by a carbon budget while its competitors are being regulated by a carbon tax (or vice versa). While this risk is already inherent in the use of entity-specific carbon budgets, this only relates to the differential application of the same policy instrument; the risks are likely to be greater when different instruments are applied to different entities.

To reduce the risk of competitive distortion, the same instrument could be used for emissions sources that share similar characteristics. In particular, budgets might be used to address emissions from all of the large point sources of emissions in the country, where one budget negotiation can cover a large amount of emissions, while the carbon tax might be used to change behaviour where there are a large number of diffuse entities and individuals responsible for emissions, for example, emissions from the combustion of transport fuels.

It is also relevant to consider the issue of different instruments for different entities for the cases of Eskom and Sasol. The large proportion of South Africa's emissions that come from these two companies make consideration of the effective regulation of these companies very important.

While there are a number of disadvantages to treating Eskom differently from other entities, there are also arguments that suggest that these downsides may be smaller than if such differential treatment was applied to other entities. The downsides relate to the challenges associated with applying different instruments to different emissions in the economy, as described above. However, it may be worth considering the separate treatment of Eskom under an approach more akin to budget. There are a number of reasons why this may be valuable and/or may not be as problematic as a differential approach for other actors in the economy:

- A carbon price relies on entities making commercial decisions in response to the price incentive it creates. The current ownership structure of Eskom may mean that Eskom makes decisions according

¹⁴ In addition to the intrinsic disadvantages associated with the use of each individual instrument in a particular context, i.e., that carbon taxes do not provide emissions certainty, carbon budgets may be cost ineffective.

to a wide range of factors, balancing commercial and noncommercial decisions. This may render the impact of the carbon price on its operational and investment decisions less effective than the same policy would on a privately owned firm. By contrast, planning documents, such as the Integrated Resource Plan (IRP), and which could form the basis of a carbon budget type instrument for Eskom and the rest of the electricity generation sector, may be a more effective instrument to change the firm's behaviour.

- A carbon price applied to the power sector would ordinarily be expected to be passed through into higher electricity prices across the board. This is made challenging by the current and likely future economic context in South Africa as is reflected in the treatment of electricity prices caused by the carbon tax in the period to 2020. At the same time, if electricity prices are not passed through then one of the primary sources of abatement associated with a carbon price (demand side abatement) would not be realised.
- The large capital investments made by Eskom may be subject to carbon 'lock-in' which would not be effectively addressed by a carbon price, but which could be tackled by a more targeted approach.
- The nature of the South African power sector means that Eskom faces limited competition (especially as renewable production is supplied under long-term fixed price contracts) and so fewer issues of competitive distortion may arise.

A budget-type approach for Eskom would need to address two key issues:

- Stakeholders would need to be confident that the budget-type approach used for Eskom would be effective at reducing its emissions and that it could be credibly enforced. It is beyond the scope of this paper to consider how this might optimally be achieved but it would be essential given the important role the company's emissions will have in meeting the PPD trajectory, at least in the short term.
- If one of the justifications for treating Eskom differently is due to the challenges associated with an across the board increase in electricity prices then this raises questions as to how demand-side abatement by electricity users could be incentivised. For many entities in South Africa, these Scope 2 emissions represent the majority of emissions and provide some of the easiest opportunities to reduce emissions. One option to realise this opportunity might be to include Scope 2 emissions in the budgets of these entities while focusing Eskom's budget on reducing its carbon intensity. In this way, industrial downstream users of electricity would be responsible for reducing emissions through lower consumption of electricity, and Eskom would be responsible for reducing emissions through reducing the carbon intensity of electricity generation, as well as reducing transmissions and distribution losses. At the same time, there would be no need to increase household electricity prices, although the corollary of this is that there would be less focus on the reduction of electricity consumption by households, which may need to be tackled in other ways such as, for instance, supportive financing arrangements for households undertaking energy (electricity) efficiency improvements. This is similar to the treatment of electricity sector emissions in a number of other jurisdictions where the electricity sector remains regulated, including the Republic of Korea, as discussed in Box 3.

BOX 3. Incentivising abatement from reducing electricity consumption in the Republic of Korea

The Republic of Korea implemented a domestic ETS in 2015. However, prices in the retail electricity market remain regulated, notwithstanding a long process of reform. (Kim, Kim, & Shin, 2013) At the same time it was recognised that encouraging electricity consumers to improve their consumption efficiency was necessary; just less than 50 percent of emissions came from the electricity sector in 2010. (IEA, 2012)

The solution adopted was to make covered firms responsible for both their direct and indirect emissions. Entities have to surrender allowances equal to the sum of their direct emissions plus their electricity consumption multiplied by the emissions intensity of electricity production. This creates incentives to reduce power consumption. However, it has also raised administrative challenges. The measurement of the emissions factor of electricity generation can be controversial, while future linking between the Korean ETS and other systems will be difficult.

For Sasol, it may be considerably more difficult to justify differential treatment. While the large proportion of emissions, and risk of lock-in, is still significant, the larger number of competitors that Sasol faces, across a number of different sectors of the economy, may pose too great a risk in terms of competitive distortion.

6.5 Scoring overview

Table 9 summarises the scores of all the considered interface options and demonstrates that there is no clearly superior instrument across all principles. Different instruments score better and worse against different principles. Broadly speaking, the following key patterns emerge:

- **Layering** is likely to be effective at reducing emissions (subject to how the instruments are designed) and provides emissions certainty but will also raise significant concerns over cost-effectiveness and sensitivity to international competition. The lack of flexibility in the budget process is also likely to make negotiations over the budgets challenging for both government and regulated entities.
- **A budget with tax on excess emissions** is probably the easiest design to introduce but will offer little emissions certainty and is unlikely to be effective at reducing emissions (subject to precisely how it is designed and implemented). Making entities liable for all emissions in the event that they exceed the budget will likely increase emissions reduction certainty but raise acute concerns over equitable treatment and is not particularly sensitive to international competition.
- **The emissions trading system and absolute baseline and credit** (with price floor and/or ceiling) provide an attractive way of reconciling the tensions between the emissions certainty provided by budgets and the cost-effectiveness provided by the tax. However, an ETS, in particular, may be challenging to implement in the country given both the complexity of this instrument and the emissions concentration within certain firms. An absolute baseline and credit mechanism, potentially coupled with a restriction on trading for certain firms, would be more practical but would not offer the potential of raising as much fiscal revenue. While this means it can be more sensitive to international competition, it also means that it will be more difficult to address distributional concerns.

- The intensity baseline and credit is particularly sensitive to international competitiveness concerns while still being attractive in terms of emissions reduction effectiveness. However, it would be very difficult to be confident over achieving a certain amount of emissions under this mechanism, while the structure of the South African economy may create challenges in setting the intensity benchmarks.
- The differentiated instrument interface option is more difficult to assess due to the large number of permutations it offers, but while it could deal with many of the concerns created by layering, it runs a significant risk of leading to inequitable treatment and competitive distortion especially if instruments are applied differentially at the entity level to competitors.

TABLE 9. There is no clearly superior interface instrument; trade-offs across different principles need to be made

Principle	Layering	Tax used to enforce the budget		Hybrid			Differentiated instruments
		Budget with tax on emissions above budget	Budget with tax on all emissions if budget exceeded	Emissions trading system	Baseline and credit—absolute emissions	Baseline and credit—emissions intensity	
Emissions reduction effectiveness	●	◐	◑	●	◐	◑	Score depends on the chosen instrument
Emissions reduction certainty	●	◐	◑	◐	◑	○	
Cost-effectiveness	○	◑	◐	●	●	◑	
Polluter pays	◐	◑	◑	◐	◑	◑	
Equitable treatment	◑	◐	○	◑	◐	◑	
Distributional issues	◐	◑	◑	◑	◐	◐	
Feasibility and simplicity	◐	◑	◑	◐	◑	◐	
Sensitivity to international competition	○	◑	◑	◑	◑	●	

Source: Vivid Economics, DNA Economics and Tyler.

This implies that the decision on how to choose between the different options will depend on the relative weight attached to different principles. To support these deliberations, the subsections below provide more detail on the relative ranking of the different interface options against each of the principles.

6.5.1 Emissions reduction effectiveness

Emissions reduction effectiveness is primarily influenced by whether entities have a continued incentive to reduce emissions, even when they are within their budget. Trading provides such an incentive by allowing firms to sell surplus budget to others. As such, interface options with trading score highest. Layering also scores well as it is always the more stringent of the two instruments that determines an entity's emissions.

TABLE 10. ETS and layering outperform other interface options on emissions reduction effectiveness

Rank	Interface option	Emissions reduction effectiveness	
		Score	Notes
1	Emissions trading system		Trading provides higher emissions reduction effectiveness by putting an implicit price on all emissions, i.e., creating an incentive for further abatement. The schemes have the potentially widest sectoral coverage and scope for trading of all interface options.
1	Layering		Although there is no trading, the carbon tax applied to all emissions continues to provide an incentive for further abatement while entities are always required to reduce their emissions to that required by the most stringent instrument.
2	Baseline and credit—absolute emissions		The trading in this option should provide similar incentives for emissions reduction as an ETS with the caveat that there is a greater chance that firms will be reluctant to reduce emissions if this is expected to determine their future baseline (similar incentives will not exist in an ETS when allowances are auctioned).
2	Baseline and credit—emissions intensity		Although trading is limited to be within sectors, this option continues to provide an incentive to reduce emissions.
3	Budget with tax on all emissions if budget exceeded		No additional incentive to abate for entities within their budgets. However, the threshold effect of the tax raises the price of emissions and encourages abatement for entities close to their budget.
4	Budget with tax on emissions above budget		No additional incentive to abate for entities within their budgets and greater probability that entities will choose to exceed their budget.

Source: Vivid Economics, DNA Economics and Tyler.

6.5.2 Emissions reduction certainty

Interface options that make greater use of budgets—set either at the entity or system wide level—provide greater certainty. This includes layering and the absolute baseline and credit and ETS options, although the flexibility of providing a buyout price reduces this certainty somewhat. The emissions intensity baseline and credit scheme provides little emissions certainty.

TABLE 11. Interface options which place greater emphasis on budgets provide greater emissions certainty

Rank	Interface option	Emissions reduction certainty	
		Score	Note
1	Layering		Emissions should always be at or lower than the budget (assuming that the budget is strictly enforced).
2	Emissions trading system		Has an economy-wide cap with a market based price that can rise to ensure sufficient abatement. Certainty reduced somewhat by a ceiling price which provides an opportunity to pay this price (tax) rather than reduce emissions.
2	Baseline and credit—absolute emissions		
3	Budget with tax on all emissions if budget exceeded		The steep increase in costs as entities reach their budget creates a strong incentive to stay within the budget.
4	Budget with tax on emissions above budget		As entities will only pay tax on emissions above the budget, there is a reasonable probability entities will choose to exceed the budget, depending on the value of tax and the stringency of the budget.
5	Baseline and credit—emissions intensity		The intensity based benchmark does not match the economy-wide absolute emissions target.

Source: Vivid Economics, DNA Economics and Tyler

6.5.3 Cost-effectiveness

Cost-effectiveness is greatest when the marginal cost of abatement is equal across and within sectors. This is achieved through interface options with trading, as the rating reflects.

TABLE 12. Trading minimises costs whereas a strict enforcement of a budget creates potentially very high costs

Rank	Interface option	Cost-effectiveness	
		Score	Note
1	Emissions trading system		Trading across all sectors of the economy provides the greatest cost-effectiveness by equating marginal abatement costs, i.e., entities who face high marginal abatement costs can purchase budget or allowances from entities who face much lower abatement costs.
1	Baseline and credit—absolute emissions		
2	Baseline and credit—emissions intensity		Trading is limited to be within the sector. Although this has the potential for increasing cost-effectiveness compared with options without trading, it does not equate marginal abatement costs across sectors.
3	Budget with tax on emissions above budget		Without trading, cost-effectiveness is reduced although entities have the option to pay the tax rather than undertake very expensive abatement.
4	Budget with tax on all emissions if budget exceeded		Without trading, cost-effectiveness is reduced. The penalty of exceeding the budget might encourage the uptake of high-cost abatement far above the tax rate per unit when entities are approaching their budget, lowering cost-effectiveness compared with a tax on excess emissions only.
5	Layering		The strict enforcement of the budget may create extremely high costs for certain entities that increase overall average costs of emissions reductions.

Source: Vivid Economics, DNA Economics and Tyler.

6.5.4 Polluter pays

The purpose of budgets and the tax is to internalise environmental cost. This is preserved in all interface options. In the case of layering and the three options with trading of emissions (baseline and credit absolute emissions, emissions intensity, and ETS) this is achieved through an explicit price; in the case of the budget with tax on excess emissions and budget with tax on emissions above budget, this is implicit and only applies if costs need to be incurred to get below the budget or when emissions exceed the budget. As the options that create an implicit price only do so in some cases, these options score a slightly lower score. Similarly, the baseline and credit schemes also score somewhat lower as they allow for the possibility of some entities achieving windfall profits. These results are shown in Table 13.

TABLE 13. All interface options internalise external cost

Rank	Interface option	Polluter pays	
		Score	Note
1	Layering		The tax and budget internalise environmental cost. The tax applies to all emissions and results in higher costs for greater emissions. The budgets can result in lower cost or uneven cost when the budget is binding instead of the carbon tax.
1	Emissions trading system		An ETS causes entities to internalise the environmental cost in decision making: either through having to purchase allowances for each additional tonne emitted or by having to forsake the opportunity to sell the allowance. However, in cases where allowances are provided for free, there may be scope for entities to both increase prices while not having to pay the direct financial cost of purchasing allowances, creating the possibility of windfall profits. This reduces the greater proportion of allowances that are auctioned.
2	Baseline and credit—absolute emissions		Baseline and credit schemes cause entities to internalise the environmental cost in decision making: either through having to purchase allowances for each additional tonne emitted or by having to forsake the opportunity to sell the allowance.
2	Baseline and credit—emissions intensity		However, given the similarity with ETS schemes with free allowance allocation, there is some possibility of windfall profits.
3	Budget with tax on emissions above budget		Both options internalise environmental cost. However, these options have the possibility to not create higher cost for higher emissions if budgets are lax, as in these cases emissions may already be below the budget.
3	Budget with tax on all emissions if budget exceeded		

Source: Vivid Economics, DNA Economics and Tyler.

6.5.5 Equitable treatment

Equitable treatment aims to ensure that cost for entities with similar emissions will be similar—in other words, for the average cost per tonne of CO₂ to be the same across all entities. None of the options score well on this, although the emissions intensity baseline and credit scheme scores higher by avoiding a potential spike in cost for sectors exceeding their benchmark due to expansion and the ETS has the option to auction off allowances to create equal average cost per tonne of CO₂; this would be in trade-off of competitiveness concerns.

TABLE 14. No option scores well on equitable treatment

Rank	Interface option	Equitable treatment	
		Score	Note
1	Baseline and credit—emissions intensity		Cost increases are less volatile than for other options as production levels do not determine costs in addition to emissions intensity changes.
1	Emissions trading system		The costs are limited to a degree by the price cap, but some entities may generate net benefits that result in an uneven treatment of entities and a low score. However, the ETS has the option to auction all allowances, which would result in equal cost per unit of emissions across and within sectors.
2	Layering		Although the carbon tax creates the same cost for all entities, the budgets can result in vastly different costs for sectors depending on how close they are to the budget—and particularly if they exceed it.
2	Baseline and credit—absolute emissions		The costs are limited to a degree by the price cap, but some entities may generate net benefits that result in an uneven treatment of entities and a low score.
2	Budget with tax on emissions above budget		Even though no benefits are created, this option may create significant costs for entities exceeding their budget and result in an uneven distribution of cost.
3	Budget with tax on all emissions if budget exceeded		This option performs worst as entities within their budget may face varying cost due to the incentive to stay within their budget and particularly compared with entities exceeding their budget.

Source: Vivid Economics, DNA Economics and Tyler.

6.5.6. Distributional issues

Flexibility in assigning budgets can lower the cost increase of certain goods, such as energy, to low-income consumers in order to lower distributional issues, and government revenue generated by the interface option can help offset distributional issues. Options relying on budgets reduce government revenue and score worse than a pure carbon tax on this aspect—which creates cost as well but equivalent government revenue. Other options have unpredictable revenue as only emissions above the budget attract a tax rate or a ceiling price.

TABLE 15. Interface options that generate government revenue and/or that can target emissions reduction efforts in certain sectors tend to score better

Rank	Interface option	Distributional issues	
		Score	Note
1	Layering		The carbon tax generates revenues on all emissions that can be used to offset negative impacts. The budgets may be adjusted to avoid cost increase on certain goods. Although the tax will result in a cost increase on goods, it does so while generating revenue to help offset the impact of these cost increases.
2	Budget with tax on emissions above budget		Budgets can be used to limit cost to certain industries. However, both options only generate government revenue to offset impacts when budgets are exceeded.
2	Budget with tax on all emissions if budget exceeded		Budgets and its other forms (free allocation and benchmarks) can be used to limit cost to certain industries. When budgets are exceeded, this option generates revenues
2	Emissions trading system		Budgets and its other forms (free allocation and benchmarks) can be used to limit cost to certain industries. Revenue can be generated by auctioning off allowances instead of freely allocating them. If allowances are freely allocated, government revenue will only be generated from the price ceiling. The amount of revenue depends on the price ceiling and the stringency of the cap.
3	Baseline and credit—absolute emissions		Neither option generates revenues to help lessen distributional issues unless prices exceed the price ceiling.
3	Baseline and credit—emissions intensity		

Source: Vivid Economics, DNA Economics and Tyler.

6.5.7 Feasibility and simplicity

Hybrid options with trading require additional infrastructure which, although it can build on the infrastructure created for offset use, is less feasible and simple than options combining the instruments more closely to their current form. Although layering builds on existing processes, the stakes of budget negotiations are higher because of the lack of a 'safety valve' if the budget is exceeded.

TABLE 16. Interface options merging current processes without adding requirements perform well

Rank	Interface option	Feasibility and simplicity	
		Score	Note
1	Budget with tax on emissions above budget		Both interface options built on existing processes and designs and can be easily implemented. Would create some challenges in aligning the five-year budget setting process with the annual (or semiannual) payment of the tax in the current departure point.
1	Budget with tax on all emissions if budget exceeded		
2	Baseline and credit—absolute emissions		Requires new processes to track and facilitate the trading of budgets.
3	Emissions trading system		Requires new processes to track and facilitate emissions trading. In addition, it potentially requires further processes to auction emissions allowances instead of relying on free allocations. Although this brings benefits, it is more difficult to set up than free allowance allocation.
3	Baseline and credit—emissions intensity		Requires new processes to track and facilitate emissions trading. It also requires the establishment of sectoral benchmarks which may be particularly challenging in the South African context.
3	Layering		Although it builds on existing processes, the sanctions for exceeding the budget are expected to be significant. As such, the negotiations are likely to be more adversarial and difficult than for other interface options and require significant administrative and political resources to carry out.

Source: Vivid Economics, DNA Economics and Tyler.

6.5.8 Sensitivity to international competition

Competitiveness concerns are lessened by budgets or free allowance allocation and by firms avoiding a cost liability on all of their emissions.

TABLE 17. Hybrid options and the budget with tax on emissions above budget can be flexible and limit competitiveness impacts whereas layering is the most rigid option creating potentially high costs and impacts on sectors in international competition

Rank	Interface option	Sensitivity to international competition	
		Score	Note
1	Baseline and credit—emissions intensity		Growth does not generate additional costs due to the intensity target. A price ceiling can limit costs. Benchmarks can be adjusted to reduce costs to sectors in international competition.
2	Budget with tax on emissions above budget		The tax acts as a price ceiling to limit costs and is only paid on some emissions. Budgets can be adjusted to reduce costs to sectors in international competition without creating distortions.
2	Baseline and credit—absolute emissions		Benchmarks and free allocations can be adjusted to reduce costs to sectors in international competition.
3	Emissions trading system		Benchmarks and free allocations can be adjusted to reduce costs to sectors in international competition. This interface option scores lower than absolute emissions baseline and credit as auctioning of allowances would create higher average costs to entities (in trade-off with providing government revenue to lessen distributional issues and a more equitable treatment of entities).
3	Budget with tax on all emissions if budget exceeded		Although the budget provides flexibility to adjust cost, entities close to the budget may experience significantly higher cost than the tax rate and, if they exceed the budget, have a large cost shock.
4	Layering		Creates cost throughout via the carbon tax, with an additional cost if budgets are exceeded.

Source: Vivid Economics, DNA Economics and Tyler.



7 Conclusions

There is no solution on how to interface the carbon tax and the carbon budget which clearly outperforms on all primary principles. As such, policymakers will need to make an informed decision based on the relative weights that they put on different principles, acknowledging that different policymakers may do this differently, and that the importance of the principles may change over time (especially as the country transitions from emissions peaking to plateauing and then declining). At its heart, policymakers face something of a trilemma: the carbon tax offers cost effective abatement but limited emissions certainty (at least in the short term), and raises concerns among some business stakeholders over competitiveness concerns (notwithstanding important design features intended to address these issues); budgets offer emissions certainty but may be very cost ineffective and potentially have even more severe competitiveness issues; while an ETS—which could offer emissions certainty and cost-effective abatement, plus the opportunity to use free allowances to address competitiveness concerns—faces a number of practical challenges in South Africa, at least in the short-medium term.

Moreover, how policymakers seek to resolve these decisions is made more difficult by the lack of a clear articulation of a strategic vision for South Africa's low-carbon economic transition. This vision would help stakeholders understand how the South African economy is expected to evolve and the possible job and economic development opportunities from a low-carbon future, as well as the framework and timeframe over which important decisions over particular emissions-intensive activities and sources of emissions will be taken. It would also guide policymakers in managing the trade-offs identified above, and allow stakeholders to anticipate how policymakers might respond.

The recommendations put forward below must be seen in this context. They reflect the consultancy team's best understanding of how the different principles may be traded off given our understanding of the views of different policymakers and other stakeholders. However, alternative views on the importance of different principles could lead to different conclusions. They are presented in three sections: opportunities for alignment that appear most attractive in the immediate post 2020 period, medium-long term interface opportunities, and the treatment of the electricity sector.

7.1 Recommended approach to interface for implementation in short term (immediately post-2020)

A budget with tax above emissions¹⁵ is probably the easiest and most practical way to interface the instruments and provide a price incentive at the margin to reduce emissions. It is also sensitive to international competitiveness which is likely to be important given the economic structure of the South African economy. However, while arguably the simplest and most feasible option, this would still require

¹⁵ Entities could also retain the right to use international and domestic offsets for compliance against their budgets.

alignment between the DEA and NT on issues such as the monitoring, reporting, and verification of emissions, and the appropriate point of compliance.

Crucially, for this interface to be effective at reducing emissions and providing enhanced emissions certainty, budgets would need to be set at a more ambitious level than they would be set in isolation or under layering to create an incentive to abate; the tax rate may also need to be higher (and constant across the economy). This option effectively creates an alternative means of complying with the budget: rather than reducing emissions, entities can elect to pay the carbon tax on emissions in excess of the budget. As such, the carbon tax provides a 'safety valve' that reduces the risk that the budget will be set at a level that requires very costly abatement to be pursued. In turn, this can allow policymakers to be more aggressive in using the budget to drive emissions reductions in the economy. Critical elements of this option include the rate of the budget and tax; the mechanics of the option allow for greater ambition in setting the individual budgets due to the tax safety valve, and also a more aggressive tax rate because it is only being applied on emissions above the budget. A further benefit of this is the creation of some government revenue that can either support the general budget or be recycled to reduce distributional impacts.

Ideally, at the same time, or shortly thereafter, the trading of budgets might be introduced. This would effectively convert the interface option into an absolute baseline and credit with a ceiling price. The introduction of trading would ensure that entities have a continuous incentive to reduce emissions even if their emissions are below the budget. It would also further enhance the cost-effectiveness of the system: as an alternative to paying the tax on their emissions in excess of the budget, entities could instead choose to purchase budget from others, if those entities were in a position to reduce and then sell their emissions reductions at a cost or price lower than the ceiling price. This greater cost-effectiveness would, in turn, allow emissions reduction ambition to be increased over time.

This would add complexity but this can be managed. Inevitably, allowing trading of budgets between entities would increase the complexity of the system, but international precedents suggest that the additional complexity can be justified given the benefits it provides. The infrastructure being developed to allow for the use of offsets under the current carbon tax design could be amended to support the trading of budgets.

It may be appropriate to introduce restrictions on trading for Sasol in order to deal with market power in emissions trading concerns. The predominance of Sasol in the emissions profile of the South African economy may introduce concerns over trading for this company. Under the hybrid scheme outlined above, it may be possible to restrict the extent to which Sasol would be allowed to buy or sell its emissions budget to a certain percentage of its initial budget, although further detailed work on the precise percentage would be required and it would be necessary to discuss the feasibility of such a restriction with the Competition Commission. Policymakers could also consider liberalisation of offset credit markets to allow for the further supply of credits, although the costs and benefits of this are beyond the scope of this report and have not been considered in detail. The treatment of the electricity sector in this regard is discussed further below.

7.2 Recommended longer term for the interface (2025 onwards)

Assuming that an absolute baseline and credit scheme is introduced, in the medium–longer term, there are two key recommendations (with different options) for policymakers to explore.

1. *Carbon budgets should be aligned with the PPD trajectory (plateauing emissions in 2025–35 and declining emissions thereafter).* In pursuing this option, there are two different mechanisms related to whether South Africa wishes to regulate emissions through a tax-like mechanism or through a quantity/ETS mechanism.
 - If the country wishes to pursue a quantity-based ETS mechanism, the stringency of the budgets allocated to entities^{16,17} would need to increase particularly quickly, but some additional ‘budget’ would be auctioned by the government. The sum of the budget allocated to firms and auctioned would be aligned with the PPD trajectory. This would give entities two options in the event that their emissions exceeded their budget: either they could pay the tax, or they could purchase allowances auctioned by the government. The scheme would effectively become an ETS with a ceiling price, allowing additional government revenues to be raised and providing strong incentives to reduce emissions. It would also be possible to explore opportunities for linking with other ETSs under this approach.
 - If the country wants to pursue a price-based mechanism, as it has chosen to do to date, then the budget would also need to become increasingly stringent. However, no budget would be auctioned. Instead, as budgets became increasingly scarce, entities would end up paying the tax (buy-out price) over an increasing proportion of their emissions. Eventually the budgets could shrink to zero and the tax would need to be paid on all emissions.

In both cases, the implication would be that a pricing mechanism (either through a tax or a quantity mechanism) would cover an increasing proportion of emissions over time, increasing the focus on the polluter pays principle and providing increasingly strong incentives for the cost-effective structural transition to a low-carbon economy. As identified above, the choice between these alternatives, the speed at which it is pursued, and how it is introduced at a sectoral level, would be made much easier by an agreed low-carbon vision for the South African economy.

2. *Introduce minimum price floor.* In addition to the maximum ‘buy-out’ price discussed above, the opportunity to introduce a minimum floor price should be pursued. This would provide entities with a stronger incentive to undertake low-carbon investment and innovation which will require a minimum carbon price in order to be profitable. The precise modality for introducing the floor price would depend on which of the two alternatives identified above was pursued.

7.3 Treatment of the electricity sector

Within this short- and long-term vision for how the budget and tax systems might be aligned, there are two different options for the treatment of the electricity sector. Once again, the choice between

¹⁶ Entities exposed to considerable international competition would have the stringency of their budgets adjusted at a slower rate.

¹⁷ Which may align with the planned decarbonisation of the power sector in the IRP.

them would require an agreed vision on the structure of the power sector in South Africa's low-carbon transition.

1. Electricity sector treated like the rest of the economy

Under the first option, the electricity sector would be treated similarly to the rest of the economy. In the short term, entities within the sector would have a budget set and be required to pay a tax for emissions in excess of the budget. These budgets would be informed by the IRP and the PPD trajectory, but would act as a compliance instrument (as they would elsewhere in the economy) rather than just as planning tools. The budget may even be relatively tighter than elsewhere in the economy given the relative lack of leakage issues in the electricity sector and because a relatively tight budget would likely lead to a carbon price signal being embedded in electricity prices, including among household consumers who will be exempt from budgets. Firms other than Eskom would have the option to trade their budget. However, Eskom, for the same reasons as for Sasol, would likely need to face restrictions on the extent that it could trade its budget, at least in the short term. This restriction could potentially be as extreme as to completely limit trading.

A broadly common treatment between the electricity sector and the rest of the economy is consistent with a view in which the sector is steadily reformed into a competitive market with cost-reflective prices and all firms responding to incentives in a commercial fashion. It would promote the alignment of South Africa with international best practice on both mitigation policy and power sector structure. Indeed, the greater use of carbon pricing envisioned in either of the two medium-long-term alternatives set out in section 7.2 could be one part of the package of reforms to promote power sector reform in the country; successful power sector reform would be consistent with either of these alternatives.

An implication of this approach is that electricity prices would increase for all consumers in proportion to the carbon intensity of the generation mix. While this is an important mechanism through which emissions reductions are incentivised, it could create concerns over the impact on vulnerable households and competitiveness concerns within industry. There are various options for dealing with the negative impacts, with the most attractive involving use of the benefit system to increase household budgets, rather than adjusting electricity tariffs in a way that distorts the incentive to reduce emissions.

- ### 2. The second alternative would be to apply a differential instrument in the electricity generation sector.
- This approach would be consistent with the electricity sector remaining broadly as it is today, with regulation not allowing an across-the-board increase in electricity price; Eskom continuing to dominate the sector; and with the view that the governance arrangements of Eskom are unlikely to lead it to respond effectively to mechanisms that place increasing emphasis on a carbon pricing signal.

In this scenario, it may make more sense to place a budget on Eskom that just focuses on its carbon intensity. This budget would be informed by the IRP and the PPD. The existing governance structures between Eskom and the government would be used to ensure compliance with the intensity-based budget. At the same time, other entities would have their Scope 2 emissions included within their carbon budgets (based on an estimated emissions intensity of the electricity sector that would be updated periodically). This would provide an incentive for firms to reduce their Scope 2 emissions without an across-the-board increase in electricity price, which may have

adverse impacts on vulnerable households (although it would also mean that these households would face a weaker incentive to improve their electricity efficiency, hence reducing overall emissions certainty). It could also increase the liquidity in the market for trading of budgets as many entities in South Africa have more Scope 2 emissions than Scope 1 emissions. As noted above, this is an approach that is consistent with how the regulated electricity sector has been treated in other emissions reduction schemes, such as in the Republic of Korea.

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Annex A

International experience

This annex provides a non-exhaustive overview of the international experience in combining forms of carbon budgets and taxes. The focus is on jurisdictions that price carbon through either a tax or market-based mechanism (such as an ETS) and, in many cases, where some form of carbon budget process has also been identified. The annex first, classifies existing approaches to highlight differences, second, distils main lessons from international experience and, third, provides a brief overview of selected existing schemes and their specific lessons valuable to South Africa.

Empirical evidence of the results of combining carbon budgets and taxes is rare and the insights of this annex are focused on theoretical and ex-ante evaluations. Only the Climate Change Agreements (CCA) in the UK have been empirically assessed for their effectiveness. Evidence in other jurisdictions is based on theoretical and ex-ante evaluations and modelling.

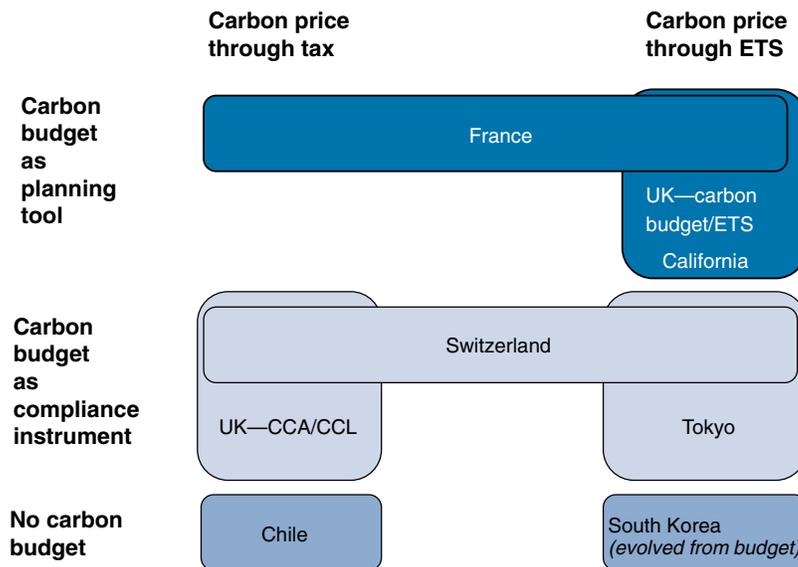
Classification of approaches

Established schemes can be grouped into how a carbon price is provided and what role, if any, carbon budgets play. Figure 5 shows the schemes reviewed across two dimensions: whether and how they use a carbon budget and whether a carbon price is introduced through a tax or an ETS.

Carbon budgets can play a role either as planning tool or as a compliance instrument. Economy-wide carbon emissions targets and associated budgets, as used, for instance, in France and the UK, are used as planning tools. They target overall emissions reduction needs and help inform what proportion of abatement may come from different instruments. However, in some of these cases, such as the UK, it is the government that faces the legal obligation to meet the economy-wide emissions budget, not individual entities. By contrast, some jurisdictions use budgets as compliance tools to restrict emissions from individual entities or sectors. For instance, Switzerland levies a fine on entities exceeding their agreed budget¹⁸ and the UK provides a discount on a carbon-based energy tax to entities that comply from a budget. In other cases, jurisdictions have moved away from using budgets as a compliance tool in favour of an ETS, such as Korea.

South Africa, at the moment, would place a price on carbon via a tax but at the same time use budgets as a compliance instrument to reduce emissions. *Hybrid interface options* (ETS,

¹⁸ Firms can elect to be covered by the ETS instead of a budget.

FIGURE 5. South Africa currently has a model similar to the UK CCA and CCL arrangement

In the UK case, there is a further complication as CCA/CCL and EU ETS overlap but this is not considered in this analysis.

Source: Vivid Economics.

absolute and emissions intensity baseline and credit) would move South Africa toward the right-hand side of the classification, whereas *layering* and *budget enforced by tax* would leave South Africa in its current position.

Main Lessons

Several main lessons for South Africa can be drawn from international experience:

- **Budgets are more commonly used as planning tools than as compliance instruments.** For instance, France, the UK, and California use budgets at the overall economy or sectoral level, but these are used to help stakeholders understand overall policy intent. In the UK, it is the UK government that is legally bound to meet its carbon budget.
- **Voluntary budgets may not deliver significant emissions reductions.** The UK's experience with its Climate Change Agreements, a voluntary carbon budget which reduces the cost of a carbon tax on energy, shows that lax budgets failed to provide low-cost abatement that could have been delivered if the full rate of the carbon tax on energy had been applied (Martin et al., 2009). Given the relative uncertainty about abatement costs and potential in countries, South Africa included, this implies that interface options providing a continued incentive to abate by creating an explicit price of carbon, such as by allowing budgets to be traded, could deliver additional abatement without imposing undue costs.
- Few jurisdictions combine carbon budgets and taxes explicitly and, if so, mainly use taxes for emissions not covered by budgets (within emissions trading systems, for example)—that is, as differential instruments. *For instance, Switzerland levies a tax on fossil fuels used by entities*

not covered in their respective emissions trading schemes. Separately, under certain circumstances, firms can opt out of the tax if they agree to a voluntary budget.

- However, approaches creating different carbon prices across and within sectors have raised concerns about cost efficiency and equitable treatment. Different carbon prices applied to entities within an ETS and covered by a tax in *Switzerland and France* have raised concerns about the efficiency of differentiated instruments. (Sceia, Altamirano-Cabrera, Vielled, & Weidmanne, 2012; Papaix & Meurisse, 2013)
- **Trading has been used to avoid inefficiency resulting from different carbon prices within and across sectors.** *Japan* and *South Korea* have started from entity-specific budgets to incorporate emissions trading. *Japan* is most akin to an absolute baseline and credit scheme, whereas *South Korea* moved to an ETS. Both jurisdictions demonstrate how entity-specific budgets can evolve into interface options including trading, whereas a tax could evolve to play the role of price floors and/or ceilings.
- Transitioning to trading—and hybrid interface options—require establishing and strengthening MRV processes and institutions. The *Korea ETS* evolved from the Target Management Scheme that set emissions caps for entities and established MRV processes and institutional capacity, particularly for firms. Similarly, the de-facto absolute baseline and credit scheme in *Tokyo and Saitama* evolved from installation level carbon budgets that introduced selling and purchasing credits instead of paying a fixed fee on emissions exceeding budgets. The process in *South Africa* until 2020 could establish the foundation for such an evolution into hybrid interface options and can take the stepping stone over a budget with tax on an excess emissions option.
- **Price ceilings and floors can help generate more cost certainty for budgets and improve long-term investment allocation.** The *California ETS* ensures continued abatement via a price floor that has been successfully implemented and rises over time. While few schemes have a hard price ceiling (the *Alberta Specified Gas Emitter Regulation* being an exemption), the *EU ETS* and the *California ETS* contain a soft price ceiling, meaning that at certain market prices additional allowances are released to reduce or halt the increase in prices.

Selected country details

This section summarises background information on selected countries, presenting the current scheme and lessons learned that are applicable to *South Africa*.

The United Kingdom

Current scheme

Through the CCA/CCL process, the United Kingdom uses budgets both as a planning tool and compliance instrument:

- the Climate Change Levy (CCL) is a tax on different types of energy delivered to nondomestic users to incentivise an increase in energy efficiency and to reduce emissions.

- Climate Change Agreements (CCA) are voluntary agreements made by the UK industry and the Environment Agency to reduce energy use and carbon dioxide emissions. They function like sector level carbon budgets. In return, operators receive a discount of 90 percent on the CCL for electricity and 65 percent on the CCL for other fuels. Fifty-three business sectors participate in CCAs, including: aerospace, steel, cement, plastics, glass, chemicals, and food and drink. Sectors failing to meet targets lose discounts on CCLs for the next three years. Otherwise, they are recertified and entitled to the discount in the next period.

The CCA is evaluated as having been ineffective in delivering cost-effective emissions reductions. Eighty-eight, 98 and 99 percent of entities were recertified in the first, second and third target periods, respectively, as negotiated budgets were seen as nonbinding, influenced in part also by sectors being able to choose their own baseline year. Martin et al. (2009) estimates that budgets could have been tightened or abolished with a better performance: *'Had the CCL been implemented at the full rate for all businesses, further cuts in energy use of substantial magnitude could have been achieved without jeopardizing economic performance.'*

Carbon budgets also serve as planning tools to guide overall decarbonisation goals until 2050.

Lessons

1. While budgets will deliver more emissions certainty, it is not intrinsically the case that they will deliver greater emissions reductions. This depends on whether the implicit carbon price in the budget is higher or lower than the explicit carbon price.
2. Options where firms or sectors can choose to opt in to one or other instrument are likely to be attractive for political economy reasons and concerns over international competitiveness, but are likely to be less effective at delivering emissions reductions.

France

Current scheme

France aligns a carbon budget, carbon tax and EU ETS to ensure minimal overlap and increase additionality. It has:

- a domestic carbon tax on natural gas, heating oil, coal and transport fuels that will increase from EUR7/tonne to EUR56/tonne by 2020 and EUR100/tonne in 2030. Companies in the EU ETS are exempt;
- an economy level carbon budget whereby it will cut its GHG output by 40 percent by 2030, and by 75 percent by 2050 (below 1990 levels); and
- sector level carbon budgets () have been set for three time periods, i.e., 2015–18, 2019–23 and 2024–28, and are aimed at industries not included in the EU ETS. However, these budgets are used as planning tools rather than compliance instruments.

TABLE 18. France’s nonbinding sectoral carbon budgets

Sector	Reduction target for 2024–28 (relative to 1990) %
Transport	29
Construction	54
Agriculture	12
Industry	24
Waste	33
Energy	Keep emissions below 2013 level

Source: Ministère de l’Environnement de l’Energie et de la Mer (2015).

Lessons

1. France is an example of a country that explicitly carved out different instruments for different emissions, e.g., only sectors not in the EU ETS are subject to the carbon tax and the budgeting approaches. This was explicitly done to avoid policy overlap.
2. Budgets are more common at the sectoral level rather than at the firm level, and they are typically considered as policy objectives not policy instruments.
3. Introducing multiple (pricing) instruments into different sectors of the economy can lead to concerns over inter-sectoral equity and perceived complexity—as illustrated by the Constitutional Council’s initial rejection of the carbon tax. Papaix and Meurisse (2013) claim that the rejection was ‘most probably because the rationale was not entirely understood by the stakeholders’. It was claimed that the incidence of the tax with respect to non-ETS firms versus ETS firms and households violated the principle of sharing costs equally, despite the rationale of avoiding overlap.

Tokyo and Saitama

Current scheme

Tokyo’s top-down approach disaggregates a city-wide target to installation-level caps coupled with trading.

Tokyo’s municipal government has a GHG reduction target of 25 percent of 2000 levels by 2020 on which it derives targets for each sector required to meet this jurisdiction-wide target, resulting in an absolute baseline and credit system, covering 40 percent of the commercial and industrial sectors, with a similar mechanism in Saitama.

The schemes in Tokyo and Saitama include mandatory installation level carbon budgets for different entities:

- office buildings and district cooling/heating plants are expected to reduce emissions from a base level by 8 percent in the first period (fiscal year 2010–15) and 17 percent in the second (FY 2015–19); and
- factories and facilities with heavier use of district and cooling plants must reduce emissions by 6 percent in the first period and 15 percent in 2015–20.

Entities must comply with their company specific target either by reducing their emissions or by purchasing credits, either at a fixed price or from other entities below their budgets.

The city governments claim that the approach has reduced their CO₂e emissions in line with or ahead of targets; however, the system faces limited external scrutiny and verification, and external effects, such as tighter energy efficiency measures and electricity price rises following the 2011 Fukushima disaster, may have contributed to emissions reductions.

Trading has been limited. Firms banked first period allowances for use in the second period, reflecting that budgets may have been lax in the first period due, likely, to external circumstances. However, they are expected to become stricter in the future. (Dabner, 2013)

Lessons

1. Firm-specific budgets with trading allowed was perceived to be a simpler and quicker approach to introduce a market-based carbon pricing scheme than having to address issues around allowance allocation under a full-fledged ETS.
2. The establishment of economy-wide and sectoral targets made it easier to identify company-specific caps.
3. Budgets may need to be more flexible to adapt to changing circumstances. While some factors influencing the effectiveness of budgets are unforeseen, such as Fukushima, other influences, such as tightening energy efficiency measures or electricity price increases, are more predictable yet can still distort the strictness of budgets within their period without adjustment.

Switzerland

Current scheme

Switzerland aligns an ETS, a carbon tax, and a voluntary carbon budget, each of which covers different types of entities:

- Emissions trading system: large companies with an installed total thermal input of 20 MW or more have to participate while the choice is optional for medium to smaller sized companies. A link to the EU ETS is scheduled for 2016 to lower costs and level the field between Swiss and EU firms.

- Carbon levy: a rate per tCO₂e is imposed on fossil fuels for installations not in the ETS. Small and medium sized companies engaged in particular industrial activities are exempt; the levy also does not affect motor fuels. The levy price acts as a hard price ceiling, since covered entities can join the ETS voluntarily and opt out of paying the levy. A third of the revenue is earmarked for programmes to cut emissions in the building sector; the rest is redistributed.
- Voluntary GHG reductions: companies engaged in particular industrial activities that emit more than 100 tonnes of CO₂e per year can be exempt from the CO₂ levy if they commit to a voluntary reduction. The voluntary reduction determines the quantity of greenhouse gases that the company may emit during the commitment period. The emissions target is calculated from the starting point along a linear reduction course to the end point in the year 2020. The results are yet to be evaluated, with an evaluation only anticipated in 2021. Failure to meet commitments incurs tax and a penalty.

The combination of the levy and the ETS creates different carbon prices across the economy. This divergence has only grown more significant thanks to an automatic adjustment mechanism in the carbon levy, which increases automatically in the subsequent year.¹⁹

Lessons

1. Switzerland is a further example of a country that explicitly carved out different instruments for different emissions, e.g., only sectors not in the EU ETS are subject to the carbon tax and the budgeting approaches. This was explicitly done to avoid policy overlap.
2. However, different instruments may still create concerns over inefficiency due to different explicit and implicit carbon prices, resulting in some firms undertaking more abatement effort than others (even if it is more costly for them to do so). The difference in carbon prices in different sectors creates inefficiencies as some sectors and installations face different costs to others: *'If a uniform CO₂ tax is used instead of the combination of instruments, the negative welfare effects are smaller. The difference can be seen as the loss of efficiency caused by the differentiation of the carbon price among sectors'* (Sceia et al., 2012).

California

Current scheme

California uses a state-wide cap-and-trade scheme (ETS) with a price floor and soft price ceiling, which covers 85 percent of emissions. It is based on state-level targets to reduce GHG emissions to 1990 levels by 2020, to 40 percent below that level by 2030, and to 80 percent below 1990 levels by 2050. To that end it features a declining total cap shrinking by approximately 3 percent each year from the second compliance period (starting 2015) onward.

¹⁹ The levy price rose from US\$10 (CHF12) to US\$30 (CHF36) from 2008 to 2010, and from US\$63 (CHF60) to US\$88 (CHF84) at the beginning of 2016, approximately six to eight times that of the allowances in the ETS.

This ETS includes a price floor (effectively a tax) and a price ceiling. The price floor (legally binding) is set at US\$13.73, increasing by 5 percent annually. A February 2015 auction sold 77.39 million allowances at this price. The price ceiling is ensured through allowances held in strategic reserve which can be released into the market should costs rise too high.²⁰

The California ETS has been successfully meeting its targets so far. However, lower than predicted emissions growth has resulted in allowance prices hovering only slightly above the price floor.

Lessons

1. Ex ante work on ETS with price floors and ceilings finds that they can produce optimal outcomes under economy-wide abatement scenarios. Pizer (2002) simulates the welfare gains and losses incurred under the use of price, quantity, and hybrid instruments to encourage emissions abatement. A 'trigger' price (price ceiling) at which additional permits are sold by the government makes a permit system much more efficient (a five-fold increase), *'while preserving the political appeal of permits: the ability to flexibly distribute the rents associated with emission rights'*.
2. In addition, price floors and ceilings may be preferred to only one or the other. Burtraw et al. (2009) model ETS programmes with a price floor and ceiling, compared to one with no controls, and one with only a ceiling. They use a linear approximation to model uncertain natural gas prices, and find the double-sided price controls preserve investment in non-emitting technologies. The 'one-sided' programme is inferior in this respect.

South Korea

Scheme

South Korea has implemented an emissions trading system with a soft price ceiling. The Republic of Korea's ETS (KETS) covers direct emissions of six Kyoto gases as well as indirect emissions from energy consumption, for a total of 68 percent of the country's emissions from 23 subsectors. The KETS evolved from a command-and-control tool called the Target Management Scheme (TMS), which set emissions caps for more than 500 entities, from any sector, with emissions over a certain threshold. Companies that failed to report emissions under the imposed level would have to pay a fine on emissions up to a maximum of US\$8,800.

It contains a soft price ceiling similar to the California ETS: around 5 percent of the allowances distributed in Phase 1 were held in reserve as a price stabilisation mechanism. Additional flexibility to promote price stability comes from unrestricted banking and limited borrowing of allowances.

²⁰ Four percent of the total number of allowances are held, in three tiers. The lowest tier allowances were priced at US\$40 in 2014 with the price increasing at 5 percent plus inflation each year.

Lessons

1. The TMS in Korea suggests that it is possible to move from mandatory budgets to a scheme involving trading. Entities were obliged to report historical emissions to controlling agencies and to set emissions targets, as well as specific implementation plans, in conjuncture with those agencies, and the grandfathering method was used, setting targets according to a baseline year, and a reduction factor the same for all entities within the same sector. A survey of entities under the TMS found that they felt it had succeeded in assisting with the transition. Many firms claimed that *'the TMS provided an exceptional opportunity to prepare . . . especially in building corporate capacities in preparing for third party verifications and creating emissions accounts.'* (Yoon & Won, 2013)
2. The stringency of targets might depend on the maturity of the scheme. In order to encourage the acceptance of future measures, a 'collaborative governance approach', with caps negotiated between government and firm, was the focus. In addition, the penalties were not as stringent as might be expected from formal regulation. (Global Green Growth Institute, 2015)

Chile

Current scheme

Chile has signed a carbon tax into law, scheduled to be implemented in 2017. This replaced proposals for an ETS. The tax will cover 42 percent of all fossil fuels—55 percent of CO₂ emissions—applied to entities that produce >50 MW of energy. Its rate is planned to be set at approximately US\$5/tCO₂e.

Lesson

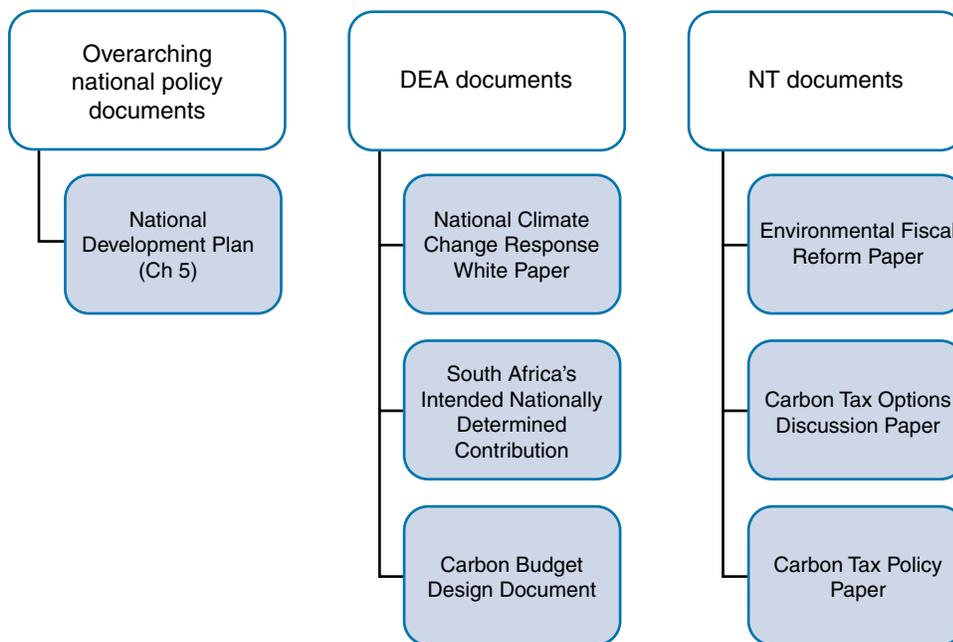
The tax and the monitoring, reporting, and verification system are being designed so as to be compatible with an ETS in the future. It has been explicitly noted that the carbon tax could function as a floor price in the future were an ETS to be introduced.

Annex B

National documents

The South African principles for scoring interface options are based on several South African policy documents as well as international experience. Figure 6 shows the national documents used to derive the principles. Box 4 provides an overview of the principles in each document which have been synthesised in Section 2.

FIGURE 6. Three categories of national documents have been considered



Source: Vivid Economics, DNA Economics and Tyler.

Overarching National Policy Documents

BOX 4. National Development Plan

The National Development Plan identifies 14 explicit principles

1. **Just, ethical and sustainable.** Recognise the aspirations of South Africa as a developing country and remain mindful of its unique history.
2. **Global solidarity.** Justly balance national interests with collective action in relation to environmental risks and existential threats.
3. **Ecosystems protection.** Acknowledge that human well-being is dependent on the health of the planet.
4. **Full cost accounting.** Internalise both environmental and social costs in planning and investment decisions, recognising that the need to secure environmental assets may be weighed against the social benefits accrued from their use.
5. **Strategic planning.** Follow a systematic approach that is responsive to emerging risk and opportunity, and which identifies and manages trade-offs.
6. **Transformative.** Address the structural and systemic flaws of the economy and society with strength of leadership, boldness, visionary thinking, and innovative planning.
7. **Managed transition.** Build on existing processes and capacities to enable society to change in a structured and phased manner.
8. **Opportunity-focused.** Look for synergies between sustainability, growth, competitiveness, and employment creation, for South Africa to attain equality and prosperity.
9. **Effective participation of social partners.** Be aware of mutual responsibilities, engage on differences, seek consensus, and expect compromise through social dialogue.
10. **Balance evidence collection with immediate action.** Recognise the immediate tools needed for informed action.
11. **Sound policymaking.** Develop coherent and aligned policy that provides predictable signals, while being simple, feasible, and effective.
12. **Least regret.** Invest early in low-carbon technologies that are least-cost, to reduce emissions and position South Africa to compete in a carbon-constrained world.
13. **Regional approach.** Develop partnerships with neighbours in the region to promote mutually beneficial collaboration on mitigation and adaptation.
14. **Accountability and transparency.** Lead and manage, as well as monitor, verify, and report on the transition.

DEA Documents

BOX 5. National Climate Change Response White Paper

The White Paper identifies nine explicit principles:

1. **Common but differentiated responsibilities and respective capabilities.** Aligning our domestic measures to reduce the country's GHG emissions and adapt to the adverse effects of climate change with our unique national circumstances, stage of development, and capacity to act.
2. **Equity.** Ensuring a fair allocation of effort, cost, and benefits in the context of the need to address disproportionate vulnerabilities, responsibilities, capabilities, disparities, and inequalities.
3. **Special needs and circumstances.** Considering the special needs and circumstances of localities and people that are particularly vulnerable to the adverse effects of climate change, including vulnerable groups such as women, and especially poor and/or rural women; children, especially infants and child-headed families; the aged; the sick; and the physically challenged.
4. **Uplifting the poor and vulnerable.** Climate change policies and measures should address the needs of the poor and vulnerable and ensure human dignity, while endeavouring to attain environmental, social, and economic sustainability.
5. **Intra- and Inter-generational sustainability.** Managing our ecological, social, and economic resources and capital responsibly for current and future generations.
6. **The Precautionary Principle.** Applying a risk-averse and cautious approach, which takes into account the limits of current knowledge about the consequences of decisions and actions.
7. **The Polluter Pays Principle.** Those responsible for harming the environment paying the costs of remedying pollution and environmental degradation and supporting any adaptive response that may be required.
8. **Informed participation.** Enhancing public awareness and understanding of climate change causes and impacts to promote participation and action at all levels.
9. **Economic, social and ecological pillars of sustainable development.** Recognising that a robust and sustainable economy and a healthy society depends on the services that well-functioning ecosystems provide, and that enhancing the sustainability of the economic, social, and ecological services is an integral component of an effective and efficient climate change response.

And a further six factors that will guide the overall approach to its climate response:

1. **Needs-driven and customised**—Employing a wide range of different types of adaptation and mitigation approaches, policies, measures, programmes, interventions, and actions consistent with the principles outlined above, but in particular, that meet the special needs and circumstances of those most vulnerable as well as being specifically tailored

(continued)

to the potential, best available solutions, and other relevant conditions related to the specific actor, organisation, sector, or subsector concerned;

2. **Developmental**—Prioritising climate change responses that have both significant mitigation and adaptation benefits and that also have significant economic growth, job creation, public health, risk management, and poverty alleviation benefits;
3. **Transformational, empowering, and participatory**—Implementing policies and measures to address climate change at a 'scale of economy' that enables and supports the required level of innovation, sector and skills development, finance, and investment flows needed to reap the full benefit of a transition to a lower-carbon, efficient, job-creating, equitable, and competitive economy. The transition will necessarily be supported and enabled by policies and measures to empower and promote the participation of all citizens through changing their behaviour to more sustainable lifestyles and livelihoods. This policy is therefore part of the broader social and economic transformation . . . and is fundamentally underpinned by a major shift toward sustainable consumption and production patterns, which decouples growth and development from any negative impacts on the environment and society;
4. **Dynamic and evidence-based**—Recognising that this policy has not been developed in a vacuum and many sectors have already researched and have experience in implementing policies and measures to address the challenges of climate change;
5. **Balanced and cost effective**—Implementing a balanced approach to both climate change mitigation and adaptation responses in terms of cost-benefit, prioritisation, focus, action, and resource allocation; and
6. **Integrated and aligned**—Providing for the integration of sector-related climate change responses into the relevant sector planning processes and their developmental policies and measures.

BOX 6. Carbon Budget Design Document

The Carbon Budget Design Document identifies principles in relation to coverage, company selection, and budget allocation.

Coverage principles:

1. Consistency between allocation and accounting—coverage of gases and activities should be identical with respect to any emissions data which is used for allocating carbon budgets, and any emissions data which is used at the end of Phase 1 of the carbon budgeting period to determine whether a company has exceeded its budget or not.
2. Consistency between accounting and reporting—since the accounting process will be wholly dependent on the reporting process envisaged in the draft GHG reporting regulations:
 - i. no data which is not reported will be eligible for use in the accounting process; and
 - ii. the basis for reporting and accounting should be identical with respect to gases, emissions factors, and common metrics.

Companies to be allocated carbon budgets:

1. Company definition—person undertaking a greenhouse gas emitting activity as listed in the 'IPCC Guidelines for National Greenhouse Gas Inventories (2006)'. To include Coal mining · Production and/or refining of crude oil · Production and/or processing of natural gas · Production of liquid fuels from coal or gas · Cement production · Glass production · Ammonia production · Nitric acid production · Carbon black · Iron and steel production · Ferro-alloys production · Aluminium production · Polymers production · Pulp and paper.

Budget allocation in Phase 1:

1. Support for existing operations—which means that CBs will be allocated to companies based on their existing emissions for their existing operations. No expectation that entities will undertake additional mitigation.
2. Any planned changes to emissions as a result of a change in emissions intensity, planned expansion. Allowance will be made for existing expansion plans for the budgeting period, based on the requisite information being provided by the company on planned expansions.

National Treasury Documents

BOX 7. Carbon Tax Options Discussion Paper

The 2010 carbon tax paper identifies seven 'issues which must be carefully addressed in carbon tax design'

1. Emissions reduction effectiveness—The ability of the tax to reduce GHG emissions.
2. Rate of tax—To the degree possible, the tax rate should be aligned with the marginal external damage costs of each additional unit of CO₂e emissions.
3. Distributional implications—Government should take measures, either in tax design or through complementary expenditure programmes, to offset the burden such a tax will place on poor households.
4. Competitiveness—Industries that participate in international trade might be at a disadvantage when competing with countries that do not price carbon.
5. Technical and administrative feasibility—Consideration needs to be given to whether the tax is placed on carbon emissions or a proxy for such emissions (e.g., fuel inputs or outputs). The administrative and compliance costs of implementing the tax should be weighed against the need to create the correct incentives.
6. Aligning policy objectives—The tax should be aligned with other government policy interventions. For example, policies to reduce energy sector carbon emissions should not be accompanied by policy measures that seek to encourage such emissions.
7. Legislative provisions—Robust legislation should provide certainty to the taxpayer and minimise opportunities for tax avoidance and evasion.

BOX 8. Environmental Fiscal Reform Paper

The environmental fiscal reform paper identifies eight criteria for assessing environmental taxes

- **Emissions reduction effectiveness.** There should, as far as possible, be a clear environmental objective and the tax must be well targeted to that objective.
- **Tax revenue.** The level of tax revenues and the way in which they are used are important considerations. Certain environmentally related taxes will be capable of raising significant amounts of revenue, particularly where the demand for the good or service being taxed is price inelastic.
- **Support for the tax.** Taxes are necessary to fund government activities and the provision of public goods and services. With every tax reform, there are likely to be winners and losers and these groups of stakeholders need to be clearly identified.
- **Legislative aspects.** The Minister of Finance is responsible for the imposition of taxes, duties, and levies. Different environmentally related tax instruments may require different legislative amendments.
- **Technical and administrative issues.** Ideally, the tax base should be as close as possible to the environmental objective although in certain cases, a proxy may be required. Where there is a clear environmental objective, the tax rate should be set according to the level of the externality. Where this is not possible, the tax rate must be sufficient to achieve the environmental (and/or fiscal) objective. Minimising the possibilities of tax avoidance, tax evasion, compliance, and collection costs are other important design considerations.
- **Competitiveness effects.** The impact of environmentally related taxes on domestic industries and other aspects of the economy such as employment and inflation are of critical importance. Where impacts on competitiveness are deemed ex ante to be unacceptable, mitigation measures may need to be considered.
- **Distributional impact.** The possibility of making environmentally related taxes progressive should be integral to the design of any proposed instrument. Where there are likely to be adverse impacts on income distribution, mitigation, or compensation measures may need to be considered.
- **Adjoining policy areas.** The extent to which environmentally related taxes can assist in meeting other government policy objectives is an important consideration. The extent to which environmentally related taxes can be designed to contribute to policy goals such as job creation, poverty alleviation, and the expansion of basic services is also important.



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