POLICY BRIEF: 3/2015

Climate change mitigation: achieving an optimal mix of measures

EXECUTIVE SUMMARY

A global benchmarking of policy instruments for effective climate change mitigation demonstrates the need for a mix of policy measures. The optimal policy package is characterised by the complementarity of its policy components, and the recognition of context: the appropriateness of the mix of measures varies from country to country depending on unique sets of climate change challenges as well as other national objectives. At present, South Africa is considering a number of policy options for climate mitigation: a carbon tax, desired emissions reductions outcomes, and required energy management plans. To determine the optimal policy package, an assessment of the range of policy instruments is needed, particularly in understanding how these instruments can be used together and in which cases they are redundant or suboptimal and burdensome.

INTRODUCTION

Climate change is a major challenge for countries across the world and has been described as the greatest market failure the world has ever seen (Stern, 2006). Tackling this global problem requires using a mix of policy measures to address multiple issues, such as the need for reduced emissions, greater energy efficiency, and the correct pricing of carbon in particular. The policy problem faced by countries is the selection and implementation of a set of policies that will successfully mitigate climate change.

Based on a global benchmark for industrial mitigation developed by TIPS*, this brief examines the key findings on the universe of instruments available and provides a set of recommendations on how governments can achieve an optimal mix of measures.

Special attention is paid to policies addressing the emissions from industry, as these account for 30% of global emissions (IPCC, 2014a). The findings of the global benchmark are also related specifically to climate change policy in South Africa. As the continent's largest emitter and 19th largest globally, the transition to a low carbon economy is a particularly difficult and costly one, especially for South Africa's energy intensive industrial sector. This policy brief cautions against the development of a single policy instrument in isolation and proposes a better understanding of policy complementarity and alignment.

CONTEXT: THE GLOBAL CLIMATE CHALLENGE

The global challenge of climate change is underpinned by multiple issues. Whereas internalising the cost of carbon by way of a carbon price is one aspect of the challenge, others include the need for adopting new technologies, information asymmetries, financing requirements, skills needed for the transition, support to green industries and most notably the time required for the transition to a low carbon economy. In addressing these multiple challenges the need for a mix of measures becomes evident. What is not as evident is how to determine the overall cost and benefit of the entire policy package of measures in order to achieve the optimal mix of measures, bearing in mind that this is a country (context) specific exercise.

** This study was commissioned by the Department of Trade and Industry, Green Industries desk, South Africa. The research for the benchmark for industrial climate change mitigation was conducted by the TIPS Sustainable Growth Team in 2014. The methodology entailed a review of international examples ad case studies of industrial climate change mitigation. Key data sources included the latest Intergovernmental Panel on Climate Change (IPCC) report, cases from the Institute for Industrial Productivity (IIP), World Bank, United Nations Industrial Development Organization (UNIDO), the United Nations Environment Programme (UNEP) as well as the World Resources Institute (WRI).*

Trade & Industrial Policy Strategies (TIPS) is a research organisation that facilitates policy development and dialogue across three focus areas: trade and industrial policy, inequality and economic inclusion, and sustainable growth

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Table 1 Typology of policy instruments for climate change mitigation

Price-based economic instruments	
Carbon tax	A price based instrument that requires polluters to pay a per unit of emissions (tax or charge) regardless of the quantity of emissions.
Other charges and fees	Similar to a carbon tax, but not termed 'carbon tax', such as specific fuel taxes.
Border carbon adjustments	Border tax adjustments (also known as border carbon adjustments) are related measures aimed at addressing the problem of loss of competitiveness and carbon leakage associated with carbon taxes. This is not a policy instrument as such, but used in conjunction with carbon tax design and implementation.
Subsidies	Granted to low GHG products and technologies, ie renewable energy subsidies; abatement subsidies.
Removal of subsidies	The removal of perverse subsidies such as the subsidies on fossil fuels.
Quantity-based economic instruments	
Emissions trading scheme	By setting a limit (cap) to the amount of emissions allowed by an industry/entity, the choice polluters face is to either reduce emissions to meet the cap or purchase emissions permits for emissions over and above the cap. These permits are tradable and the market created for such permits are knows as an emissions trading scheme (ETS).
Baseline-and-credit scheme	Operates in terms of average CO^2 intensity and sets targets based on emissions intensity. On a firm by firm basis where operation below a baseline is achieved, credits are earned and for performance exceeding a target, credits would need to be purchased (based on a compliance cycle timeline always comparing performance to a baseline established upfront).
Green certificates	Also known as Renewable Energy Certificates are issues to certify renewable energy sources. Firms pay for green certificates which mimic a subsidy on renewables, and can be applied voluntarily or are mandatory. Trading in green certificates thus determines the market value of these certificates.
White certificates	Captures the energy savings and energy consumption reductions achieved that can be traded as white certificates.
Regulatory approaches	
Performance standards	Specify maximum allowable GHG emissions for particular processes or activities. This is a target level of emissions that producers must comply with- generally associated with penalties for non-compliance. Performance standards can also be termed Emissions Standards. An emissions cap can be established to set this upper limit of allowed emissions.
Technology standards	Mandate specific pollution abatement technologies or production methods.
Product standards	Define the characteristics of potentially polluting products and include the labelling of appliances in buildings, industry and transport sectors.
Carbon budget approach	A quantity based approach to achieve 'desired emissions reduction outcomes' (DEROs) at sector, sub-sector, company or entity level.
Information and education programmes	
Awareness-raising programmes	Information programmes raising awareness can take the form of eco-labelling or certification schemes for products and technologies as well as the data collection and disclosure on GHG emissions by significant polluters. These can be implemented through eco-labelling schemes or certification programmes.
Government provision of public goods and services, and procurement	
Infrastructure and public transport services	Government funding of public goods and services aimed at directly reducing GHG emissions through infrastructure and transport services that use energy more efficiently.
Removing legal barriers	The removal of institutional and legal barriers that promote GHG emissions.
R&D funding	Government funding and provision of research activities.
Voluntary actions	
Industry agreements	Industry agreements such as voluntary agreements and negotiated agreements are e established generally between governments and industrial customers and in some cases industry associated.
Self-certification	A process by which firms choose to subscribe to achieving the standards of certification schemes that they join voluntarily.
Environmental and energy management systems	The voluntary imposition of systems to measure environmental and energy management performance, including self-imposed targets to be achieved.

Source: TIPS, based on IPCC (2014a, 2014b) and Cloete et al. (2013)

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A necessary starting point is to survey the landscape of available policy instruments for climate change mitigation, understanding not only their purpose and design, but more specifically how these instruments are implemented and uncovering the best mix of measures, based on complementarity.*

In practice, the complexity of policy packages has a strong temporal element, determined by its management and performance over time, rather than at a given point in time. As such, the cost-benefit analysis should be conducted at the level of the entire policy package and not at the individual instrument level, considering both the impact of the policy mix for greenhouse gas (GHG) emission mitigation and its manageability over time (Hood and Guelff, 2013).

FINDINGS FROM A GLOBAL BENCHMARK STUDY

There are a number of policy instruments available for use that can be applied at different levels of the economy. More than 20 broad types of instruments have been used for mitigation by industry, classified into six main categories. These include, *inter alia,* economics instruments (both quantity and price based), regulatory approaches, and information-based measures as well as the promotion of voluntary actions. Table 1 (page 2) sets out a brief description of these instruments. The categorisation for these instruments was adapted from international sources such as the IPCC, and the typology developed by TIPS, to explain the universe of instruments available for climate change mitigation.

Figure 1 (page 4) shows how these measures are typically applied at different levels, ranging from specific processes at firm level to economy wide applications. A review of 575 policy instruments implemented for industrial emissions mitigation showed that information programmes are the most prevalent policy instruments globally for achieving energy efficiency, accounting for 40% of implemented programmes. Energy efficiency (reduction in use and dependency on traditional sources of energy) is the main contribution toward climate change mitigation relevant to the industrial sector. The IPCC highlights other key strategies as material use efficiency, recycling and re-use of materials and products, product service efficiency, and demand reductions (IPCC, 2014b). Similarly, while the mitigation of GHG emissions remains the main target of industrial emissions reduction, waste management activities and non-CO^2 emissions reductions must also be achieved for climate change mitigation (which should form part of policy packages).

This review was included in the latest IPCC report and is the most comprehensive review of industrial climate change mitigation to date, covering both developed and developing countries. The results show that 35% of programmes implemented are based on economics instruments (such as carbon taxes and emissions trading schemes), followed by voluntary actions, which make up 25% of programmes (Tanaka, 2011). While it is possible to look at which instruments are the most commonly used, there is greater value in understanding which combinations of instruments are more effective. Even though economic instruments are considered the most appropriate way forward for many countries (World Bank and Ecofys, 2015), they are not yet widely used. This is in part, due to the theoretical considerations for instruments over the practical and feasibility considerations which often hamper their actual use.

The map in Figure 2 (page 5) illustrates the distribution and depth of the implementation of economic instruments for climate change mitigation. The use of carbon taxes is in fact much less prevalent than initially expected and this is noted in the most recent IPCC report. Additionally, in most places where they have been implemented they have been accompanied by free allowances and special conditions. These free allowances and exemptions mean that there is often not full coverage of all emissions by carbon tax. Most striking is that these instruments are implemented as part of a mix of policy instruments- which demonstrates the need for supporting mechanisms and the reality that each instrument is limited in its application. These trends in carbon taxes are captured in Figure 2 (page 5) and Figure 3 (page 5).

Economic instruments for climate change mitigation are typically aimed at altering the behaviour of targeted participants or changing the conditions for specific participants to achieve aggregate emissions reductions. Economic instruments are further categorised in terms of price- or quantity-determined measures. Price-based instruments require the polluter to pay a price per unit of emissions in the form of a tax or charges, without prescribing a set quantity of emissions or emission intensity. Quantity-based policy instruments take the form of tradable allowances or a permit system where a specific total quantity of pollution/emissions is defined or 'capped', and trading the rights to these capped emissions is allowed. Taxes and subsidies cannot be used to directly target quantities of GHG emissions.

** Complementarity by definition refers to those measures that work as best in combination with each other for achieving a specific goal. In terms of mitigation policy, this means achieving the target of low-cost, efficient and environmentally effective mitigation of GHG emissions, through policies that are both feasible and relatively easy to implement. (Hood, 2011)*

Figure 1: Policy instruments for industrial climate change mitigation *(Source: Tanaka, 2011)*

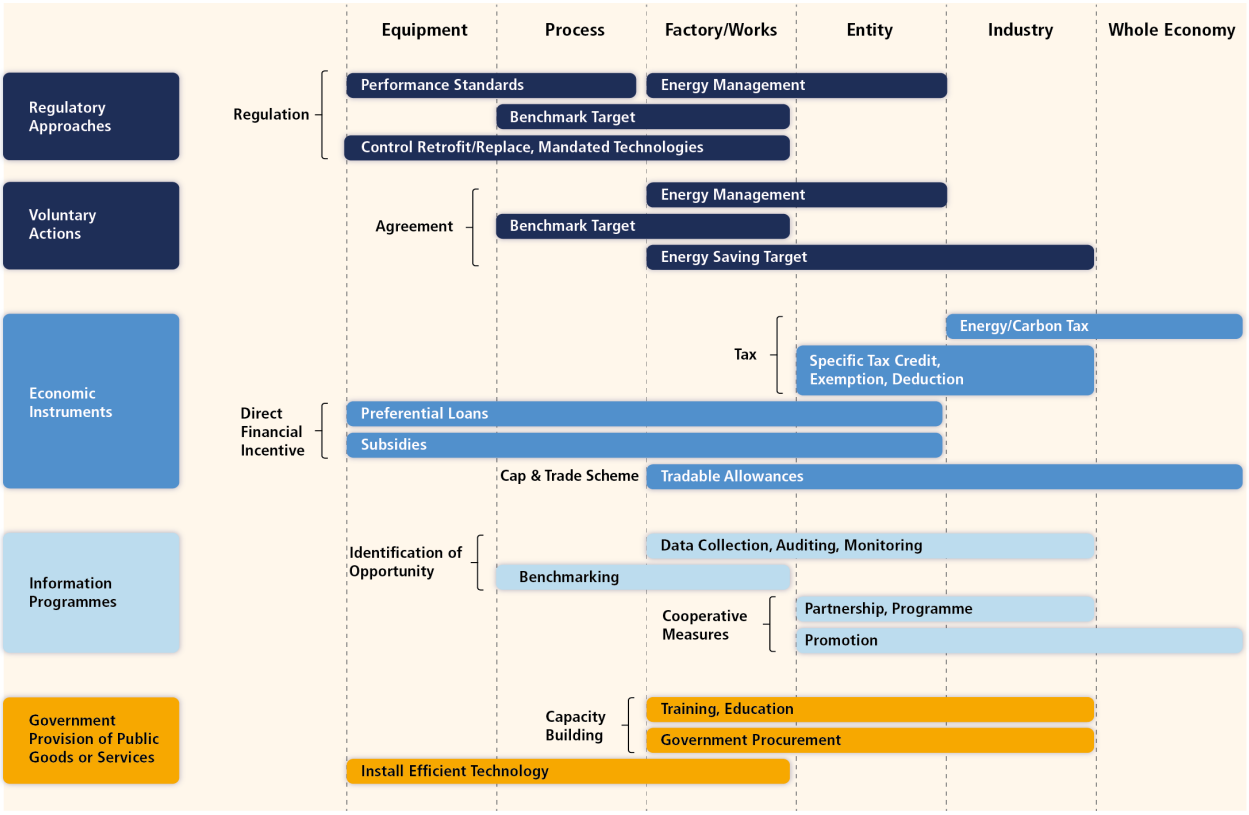


Table 2: Description of the 12-criteria analytical framework

Criteria	Description
Environmental effectiveness	The ability of the instrument to trigger a reduction in GHG emissions. This is highly correlated to the strength of enforcement (i.e. monitoring and evaluation) of instruments.
Economic efficiency	Economic efficiency is the ability of an instrument to generate the mitigation of GHG emissions at the least cost possible, i.e. when the socially optimal amount of abatement is reached. These means that cheaper options must be utilised first, and that more expensive options must only be considered once all cheaper have been exhausted.
Encouragement of substitution	The ability of an instrument to incentivise a switch to lower-carbon production processes and products.
Impact on technology development	The ability to incentivise the development of new low-carbon technologies. Mechanisms which reduce the cost and risks of R&D, or which make new low-carbon products and services (increasingly) more valuable have a stronger ability to incentive technology development.
Administrative burden	The level of public administration and management required by the instrument. This depends heavily on the institutional arrangements and capacity of the implementing country.
Information requirement	The amount of information and knowledge which is required by the state to efficiently design and implement a measure.
Distributional/ equity effect	The ability to design the instrument in such a way that its impact is differentiated based on different parts of society and address equity issues (i.e. the impact should be progressive rather than regressive).
Support for the mech-anism	The political acceptance by all stakeholders (government, business, labour) of the measure. This depends heavily on the design features of the instrument and appears very context specific.
Competitiveness impact	The impact of the instrument on the competitiveness of the country's industries. This is largely associated with a potential decline in international competitiveness compared to industries in countries without similar carbon pricing and possible carbon leakage.
Interaction with other policies	The ability to interact with other mitigation measures (intra-policy interaction) as well as other government objectives (inter-policy interaction), such social and economic objectives.
Fiscal affordability	The cost (or revenue thereof) associated with the design and implementation of the instrument for the state.
Flexibility	The degree of flexibility which is provided to emitters to meet their targets. Flexibility over economic cycles is particularly important.

Source: TIPS, based on IPCC (2014a, 2014b) and Cloete et al. (2013)

Figure 2: Global overview of economic instruments for climate change mitigation

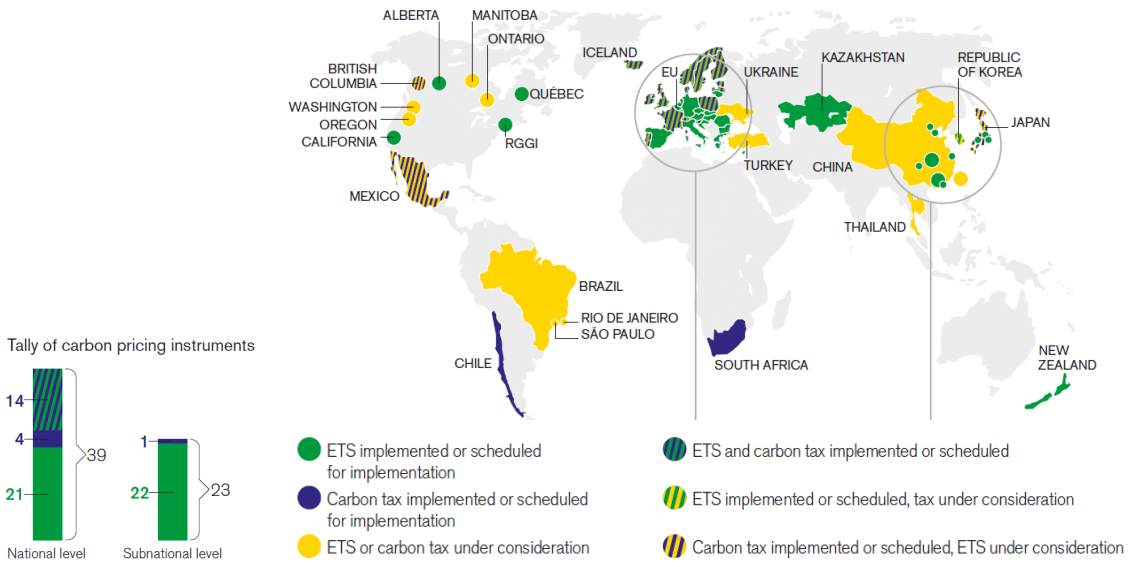
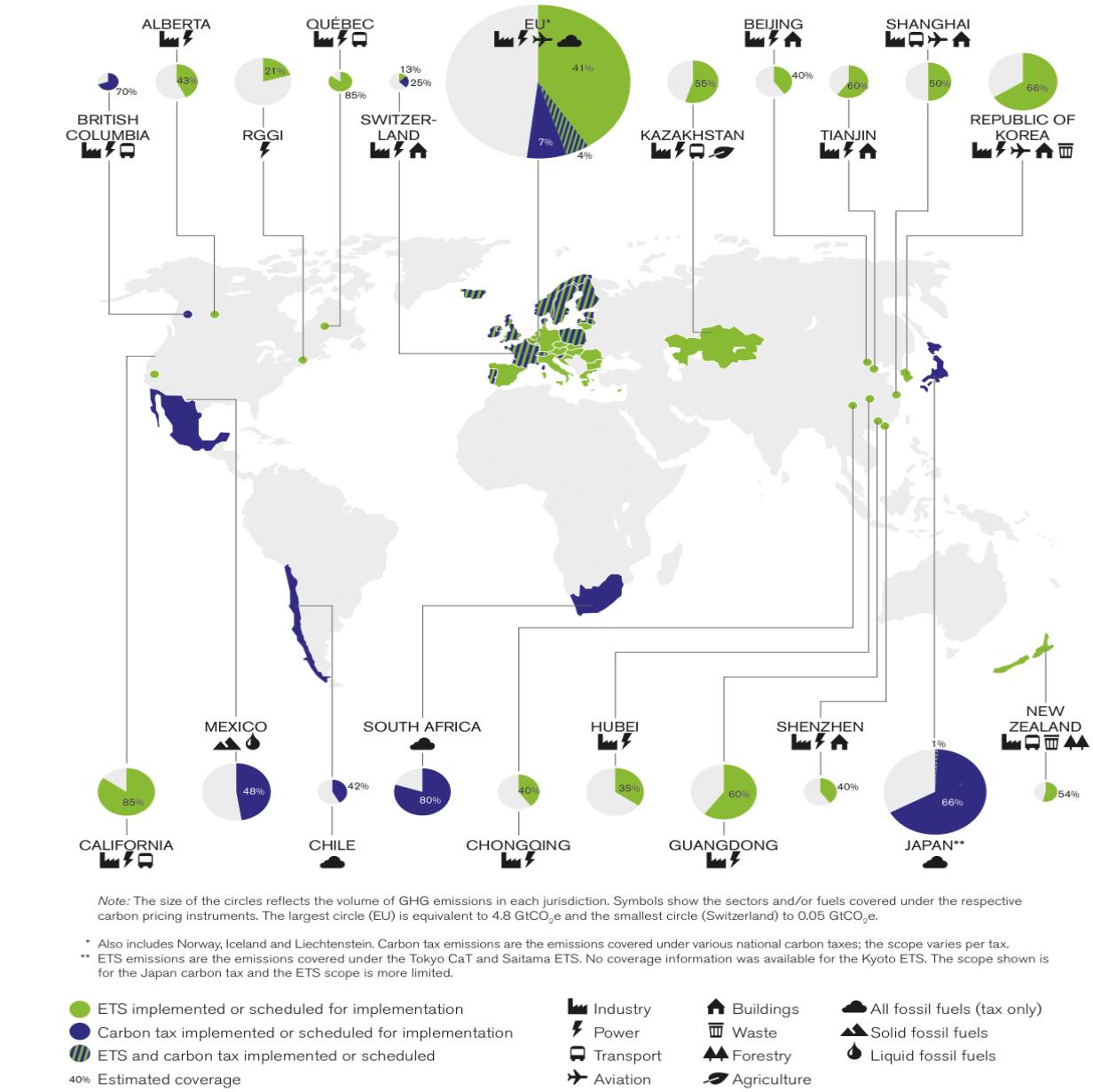


Figure 3: Carbon pricing instruments (implemented and planned) and their coverage



Source: Figure 2 and Figure 3: World Bank and Ecofys, 2015

Table 3: Goods and services trade openness indicator 2000-2013 *(Source UNCTAD, 2015)*

Instrument	Type	Comments
Carbon tax	Market based, price instrument	The carbon tax is planned for implementation in 2017. The initiative to introduce this tax is driven by the National Treasury tax division in consultation with key stakeholders. At present the details of this tax are under discussion; proposed at R120 per tonne of CO^2, with a range of exemptions and allowances and off-sets for industry considered.
Desired Emissions Reduction Outcomes (DEROs)	Market based, quantity instrument	The Department of Environmental Affairs has been the driver of the quantity based DEROs proposal, with the publication of the GHG Inventory for public comment in June 2014.
Energy management plans	Voluntary/ Regulatory instrument	The Department of Energy is championing the planned requirement for energy management plans by businesses- based on the reality that many companies do undertake such energy management plans. This is however not yet legislated or made mandatory for companies to comply with.

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SELECTING AN OPTIMAL POLICY MIX

The cost-benefit analysis of climate change policies must be analysed as an entire suite of policies used comprehensively. This is vital to the selection and implementation of the optimum policy package. The mistake is often made of analysing the performance of a particular policy instrument in isolation. The holistic evaluation of policy instruments must be based on a pre-determined set of criteria. TIPS has consolidated a 12 criteria analytical framework that is useful in assessing these instruments, described in Table 2 on page 4.

For the successful implementation of a mix of instruments, the specific country context should be taken into account when developing policy instruments. To be most effective in a specific context, decisions need to be made about the selection of instruments. These decisions are based on the targets (objectives) of the instruments (i.e. which problem they address) but also the phasing of the implementation and level (country-wide, sector specific or firm level targeted). These are two factors to consider in shaping the overall package design and will undoubtedly affect its implementation. Specific contexts (especially the current energy mix and the political feasibility of measures) will shape not only the 'what' decision of instruments chosen but also the 'how' of introducing these instruments.

UNIQUE CHALLENGES: DIFFERENCES FROM COUNTRY TO COUNTRY

There is no silver bullet for climate change mitigation and what constitutes an optimal policy package will differ from country to country, based on a number of factors such as geography, nature of industrial activity and pre-existing regulatory frameworks. Despite these differences, there are lessons to be learnt in terms of best practice where specific instruments have been used effectively. The selection of lessons shared in this policy brief is intended to be relevant to South Africa and its considerations regarding a suite of instruments.

CHALLENGES FOR SOUTH AFRICA

South Africa's industrial development has historically been based on the abundant and cheap supply of coal-fired electricity. In recent years, however, these circumstances have drastically been altered with significant electricity price increases as well as a shortage and interrupted supply of electricity. To some extent this has triggered the transition to alternative energy sources such as renewable energy and gas solutions, although the cost increase to companies is a major challenge in the short term.

In South Africa the energy and industrial sectors respectively accounted for 61% and 19% of the country's total emissions respectively. The priorities of continued economic growth, creating jobs and addressing social inequality accompany the goal of environmental sustainability. In addition, South Africa has committed itself to an emissions trajectory that peaks at 34% below a business-as-usual trajectory in 2020 and 42% below in 2025, subject to the adequate provision of financial resources, technology transfer and capacity building support provided by developed countries (UNFCCC, 2011). South Africa is pursuing a number of mitigation strategies in the form of different policy instruments, proposed by various government departments. Table 3 captures some of the key measure under consideration.

At present the National Treasury is looking to implement a carbon tax (economic instrument), while the Department of Environmental Affairs is designing a quantity based instrument (known as Desired Emissions Reduction Outcomes) and other measures such as required energy management plans (regulatory) are being conceptualised by the Department of Energy. While there are existing measures (such as negotiated agreements, demand side management programmes, voluntary actions, tax incentives (the dti's 12 L programme), concessional funding, support programmes, standards and R&D support (R&D tax incentive) that could be associated with measures to reduce GHG emissions from industrial sectors, these have not necessarily been considered in conjunction with other proposed climate change mitigation policies for the whole economy. The problem is first that the policy universe of options has not been well understood in South Africa and second that the selection and implementation of instruments to follow is not clear and integrated.

CONCLUSION

Multiple challenges underpin the global climate change problem, resulting in the practical and policy conundrum of choosing the right policy instruments to tackle a number of issues simultaneously. The global benchmark of policy measures has shown that no country relies on a single policy instrument to address climate change mitigation. Instead, the need for a mix of measures is essential. It also provides insights into the issue of complementarity, exploring both the theoretical and practical considerations for policy packages that have worked in certain countries. These two key lessons form the basis for adopting a two-pronged approach to achieving an optimal mix of measures which consists of (1) understanding the universe of policy instruments available for climate change mitigation and (2) undertaking a country specific process to select an optimal policy package based on complementarity and national climate change and other development considerations.

What this means in the context of South Africa's pursuit of multiple mitigation instruments, is a need to streamline policies to achieve an optimal mix of measures. While a carbon tax is currently the central policy instrument under consideration for internalising the cost of carbon to the economy, its interaction with other policy instruments such as the DEROs proposal and regulatory approaches such as energy management plans, and other incentive based and voluntary programmes, has not been adequately assessed. While is important to have broad stakeholder engagements on the topic of policy complementarity, it is crucial that this feeds into a mechanism that will result in policymaking that has taking into account the above considerations.

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