

Reducing Greenhouse Gas Emissions Carbon Tax Policy Paper

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national treasury

Department:
National Treasury
REPUBLIC OF SOUTH AFRICA

Process with Carbon Tax Proposal

- 2012 and 2013 Budget noted the current carbon tax proposal, and indicated a discussion paper will be released to elaborate the proposal
- 2006 and 2010 Discussion documents released by National Treasury
 - 2006 Environmental Fiscal Reform Policy Paper
 - 2010 *“Reducing Greenhouse Gas Emissions: The Carbon Tax Option”*
- This May 2013 paper updates the 2010 paper, and is now a Carbon Tax Policy Paper
- It is the second and final policy paper on carbon tax requesting public comment, before NT releases draft legislation to implement the carbon tax from 1 January 2015
- Public comments to be submitted by 2 August 2013

Carbon tax policy paper

1. Introduction
2. Policy coherence
3. The economics of carbon pricing
4. A carbon tax vs. an emissions trading system
5. International carbon price developments
6. Modelling the economic impacts of a carbon tax
7. Carbon tax design features
8. Revenue recycling and transitional support measures

Annexure A: Results from modelling the impacts of a carbon tax

Annexure B: Carbon price developments in other countries

Annexure C: Energy efficiency tax incentive

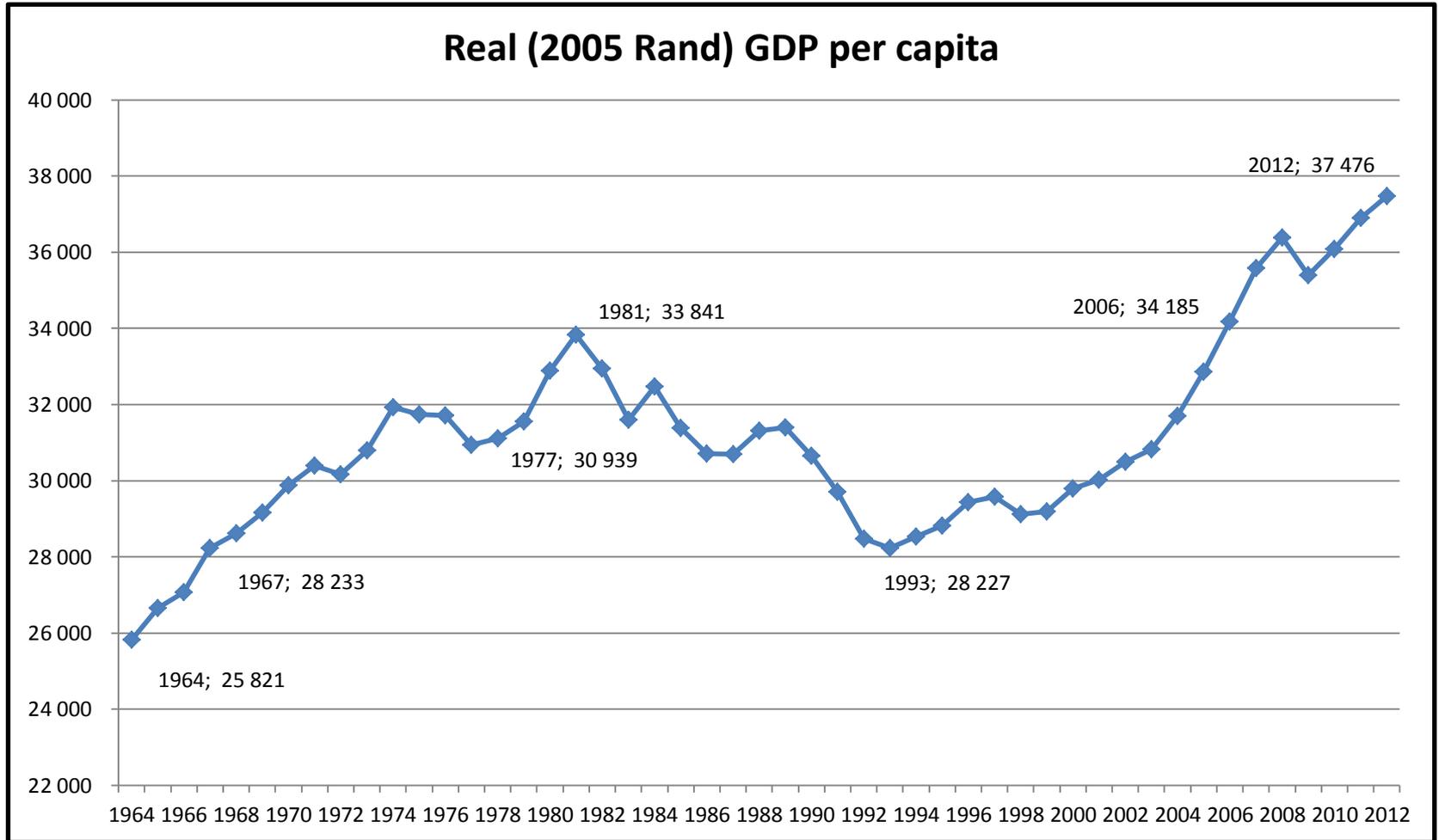
Annexure D: Benchmarking

Annexure F: Carbon Offsets

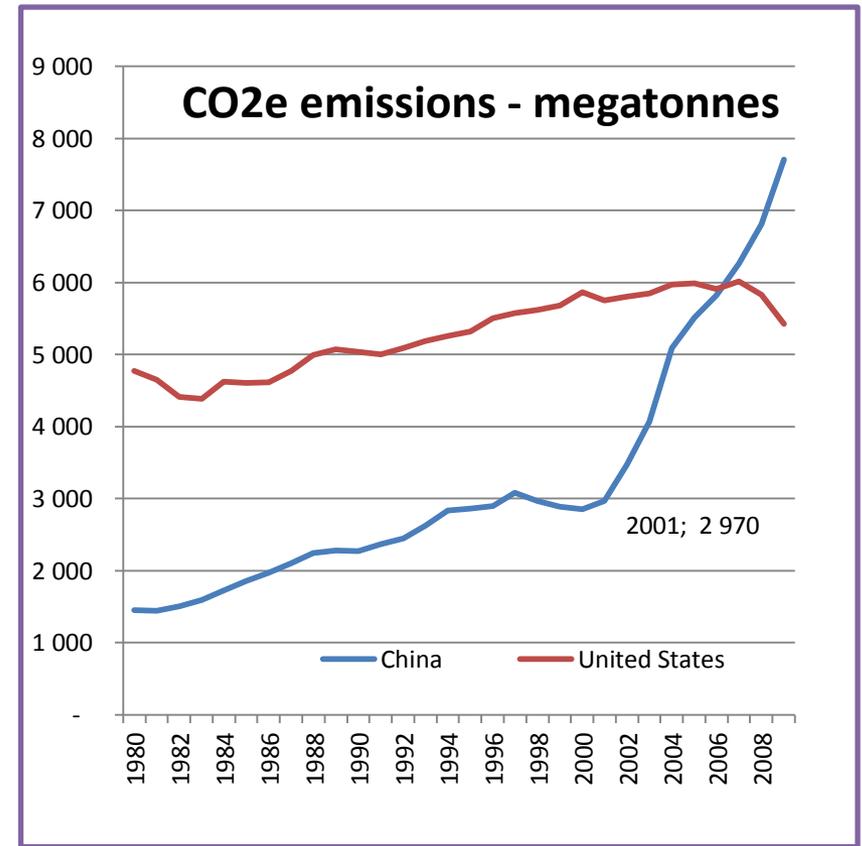
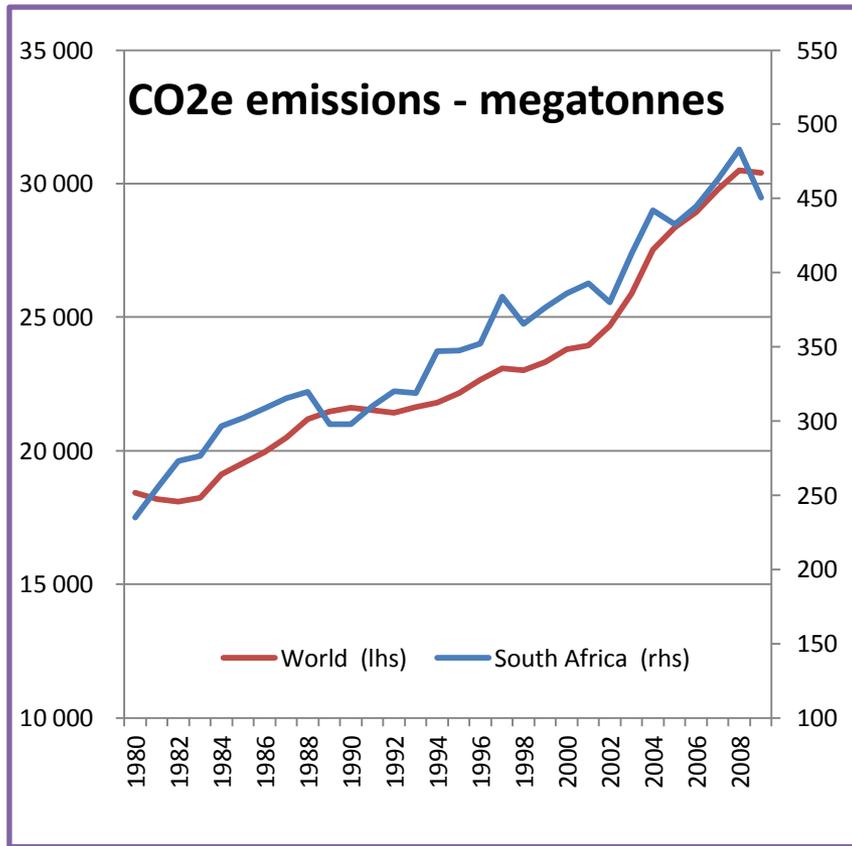
Introduction

- High levels of economic growth must be sustained to facilitate significant reductions in the levels of unemployment, poverty and income inequality.
- However, it's not just the quantity of growth that matters but also quality, and incorporating sustainable development considerations in policy development and decision making must actively be pursued.
- Market failure: market prices do not always reflect full economic costs of production or consumption / use;
- Government intervention necessary, e.g. through, regulations, taxes, incentives, etc.

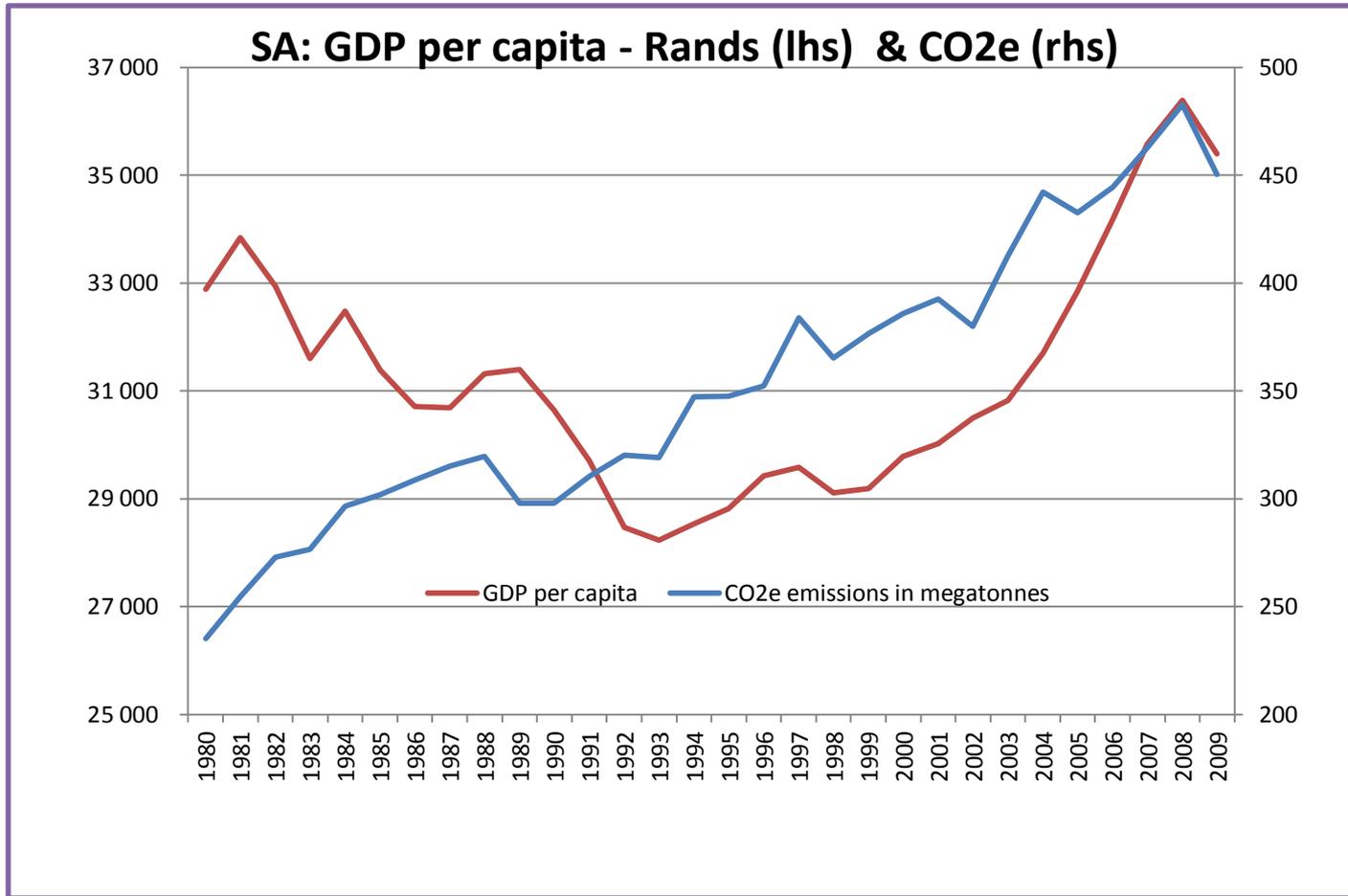
Real GDP (2005 prices) per capita



CO₂e emissions in megatonnes



SA: GDP per capita & CO₂e emissions



Environmental Challenges

- South Africa faces a number of environmental challenges that is likely to be aggravated as the economy grows if natural resources are not properly managed and protected. These include:
 - emissions of local air pollutants that manifest in poor air quality with adverse impacts on society;
 - excessive emissions of greenhouse gases that contribute to global warming (Climate Change);
 - inappropriate land-use that results in land degradation;
 - biodiversity loss and damage to terrestrial ecosystems;
 - deteriorating water quality with severe impacts for South Africa as a water stressed nation; and
 - increasing levels of solid waste generation comparable to many developed countries.

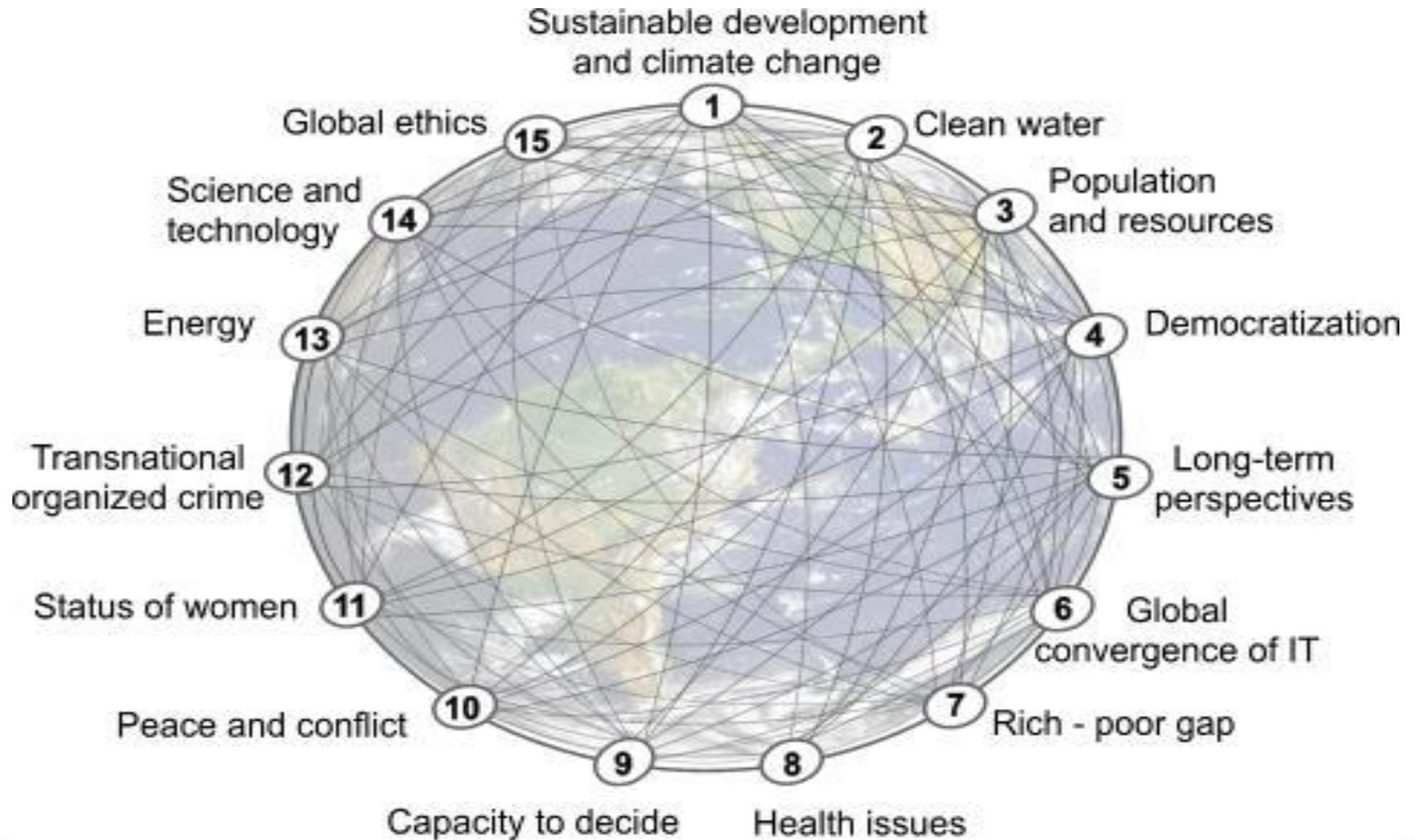
The Poverty Impacts of Climate Change, Economic Premise, The World Bank, March 2011. Number 51

- Over the last century, the world has seen a sustained decline in the proportion of people living in poverty. However, there is a growing concern that climate change could slow or possibly even reverse progress on poverty reduction.
- This concern is rooted in the fact that most developing countries are more dependent on agriculture and other climate-sensitive natural resources for income and wellbeing, and that they also lack sufficient financial and technical capacities to manage increasing climate risk (adaptation).
- Climate change is likely to lead not only to changes in the mean levels of temperatures and rainfall, but also to a significant increase in the variability of climate and in the frequency of extreme weather-related shocks.
- ...much of the poverty impact is expected to be concentrated in Africa and South Asia, both of which would see more substantial increases in poverty relative to a baseline without climate change.

2012 State of the Future: The Millennium Project

15 Global Challenges that are interdependent – not ranked

in order of importance



2012 State of the Future: The Millennium Project

- Climate change adaptation and mitigation policies should be integrated into an overall sustainable development strategy.
- Without sustainable growth, billions more people will be condemned to poverty, and much of civilization could collapse, which is unnecessary since we know enough already to tackle climate change while increasing economic growth.
- Challenge 1 will be addressed seriously when green GDP increases while poverty and global GHG emissions decrease for five years in a row. (p.31)
- Over half of the new energy generation capacity comes from renewable sources today.
- The costs of geothermal, wind, solar, and biomass are falling.
- Setting a price for carbon emissions could increase investments.
- If the full financial and environmental costs for fossil fuels were considered—mining, transportation, protecting supply lines, water for cooling, clean-ups, waste storage, and so on—then renewables will be seen as far more cost-effective than they are today.

2012 State of the Future: The Millennium Project

- If the long-term trends toward a wealthier and more sophisticated world continue, our energy demands by 2050 could be more than expected.
- However, the convergences of technologies are accelerating to make energy efficiencies far greater by 2050 than most would believe possible today.
- So the world is in a race between making a fundamental transition fast enough to safer energy and the growing needs of an expanding and wealthier population. (p.24)
- large-scale carbon capture and reuse has to become a top priority to reduce climate change, such as using waste CO₂ from coal plants to grow algae for biofuels and food or to produce carbonate for cement.
- Carbon capture and sequestration could reduce CO₂ emissions in industrial applications by 4Gt if 20–40% of facilities are equipped with CCS by 2050. This can be expensive, requiring the introduction of carbon taxes to make it economically attractive. (p.79)

National Climate Change Response White Paper (1)

- South Africa is a relatively significant contributor (1%) to global climate change with significant GHG emission levels from its energy-intensive, fossil-fuel powered economy .(page 8)
- The Polluter Pays Principle (page 11)
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.
- Strategic Priorities (pages 13 & 14)
 - Facilitated behaviour change
Prioritise the use of incentives and disincentives, including regulatory, economic and fiscal measures, to promote behaviour change towards a lower-carbon society and economy

National Climate Change Response White Paper (2)

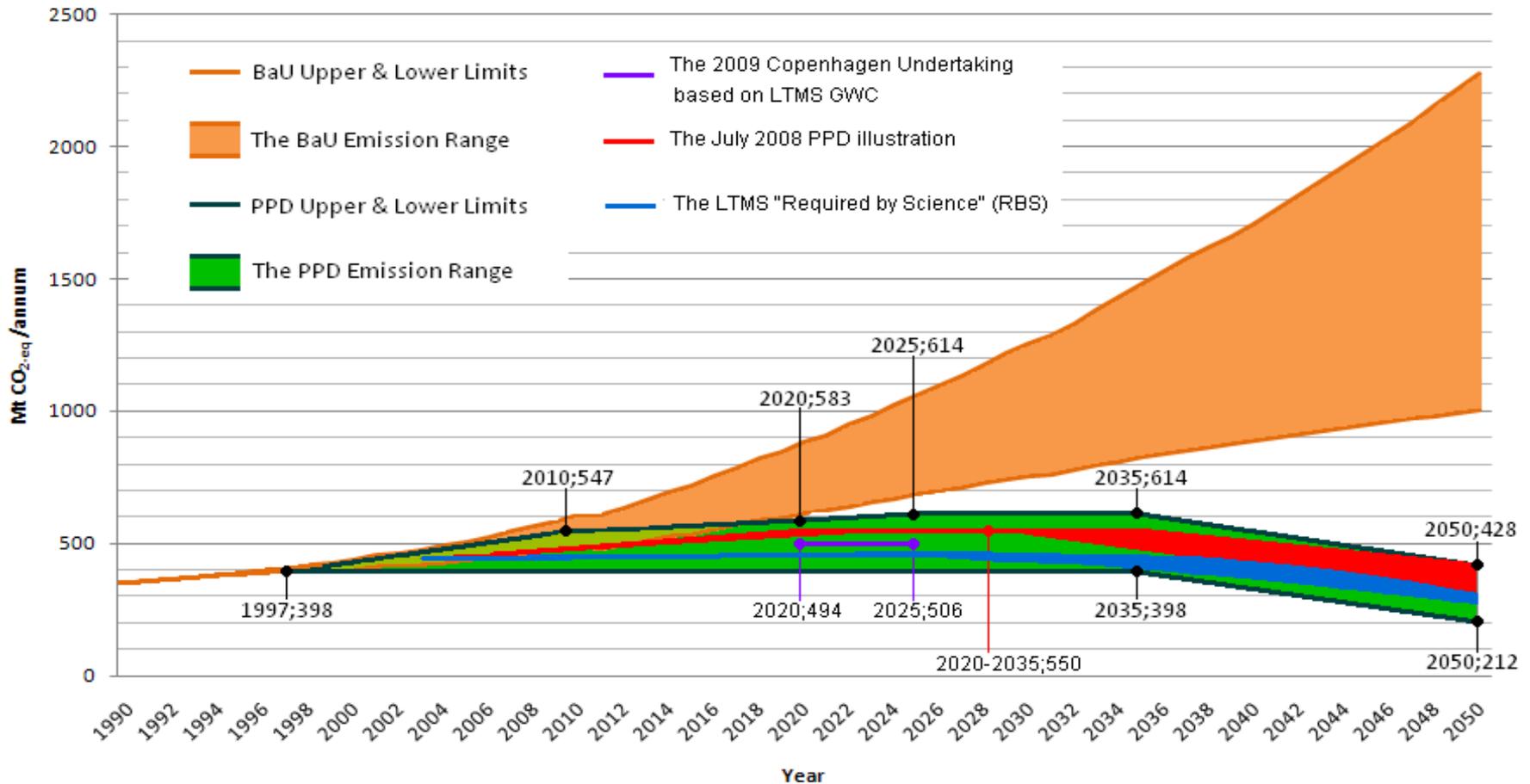
- Mitigation potential (Energy & Transport) (page 26)
 - energy efficiency, demand management, less emission-intensive energy mix, (e.g. renewable energy)
... with the consequent economic benefits of improved efficiency and competitiveness as well as incentivising economic growth in sectors with lower energy (and emissions) intensity .
 - A mix of economic instruments, including market based instruments such as carbon taxes and emissions trading schemes, and incentives, complemented by appropriate regulatory policy measures are essential to driving and facilitating mitigation efforts and creating incentives for mitigation actions across a wide range of key economic sectors.
 - Carbon capture and storage

National Climate Change Response White Paper (3)

- Managing response measures (page 29)
 -, South Africa may be economically vulnerable to measures taken both internationally and nationally, to reduce GHG emissions.*
 - ... trade barriers, a shift in consumer preferences and a shift in investor priorities.*
- South Africa (SA) committed to curb GHG emissions by 34% by 2020 and 42% by 2025 below the BAU trajectory (subject to provision of adequate financial, technological and capacity-building support)
- SA's has aspired to its emissions peaking between 2020 and 2025, remaining stable between 2025 and 2035 for a decade and declining in absolute terms from around 2035 (PPD)

GHG emissions: Peak, Plateau and Decline Trajectory

The desired South African climate change mitigation outcome - the "Peak, Plateau and Decline" (PPD) greenhouse gas emission trajectory – comparison with other popularised conceptions of PPD



Externalities

- “Externalities refers to situations when the effect of production (and) or consumption of goods and services imposes costs or benefits on others which are not reflected in the prices charged for the goods and services being provided”.
- Positive externalities (“spillovers”) : Research & Development, Health, e.g. immunization, basic education, road safety, street lighting, energy efficiency savings, etc.
- Negative externalities (“spillovers”) : Local air pollution, noise, congestion, water pollution, GHG emissions – climate change, etc.

Options for Intervention

- **Command-and-control measures (Regulations):**
 - Use of legislative or administrative regulations that prescribe certain outcomes;
 - Usually target outputs or quantity, e.g. minimum ambient air quality standards, within which business must operate.
- **Market-based instruments:**
 - Policy instruments that attempt to internalise environmental externalities through the market by altering relative prices that consumers and firms face;
 - Utilise the price mechanism and complement command-and-control measures. Under certain circumstances MBIs are considered more efficient than command-and-control measures

Carbon taxation and fiscal consolidation: the potential of carbon pricing to reduce Europe's fiscal deficits Vivid Economics, May 2012 (for the European Climate Foundation and Green Budget Europe)

- “Markets operate through prices, and although there are market failures which limit the responsiveness of energy users to changes in prices, without those price signals, it will be difficult, if not impossible, to change behaviour. Carbon prices, in the form of taxes and trading are an essential part of the policy prescription, and they need to be sufficiently high and sufficiently stable to promote reaction from the market”. p.27

Rationale for a carbon tax / price

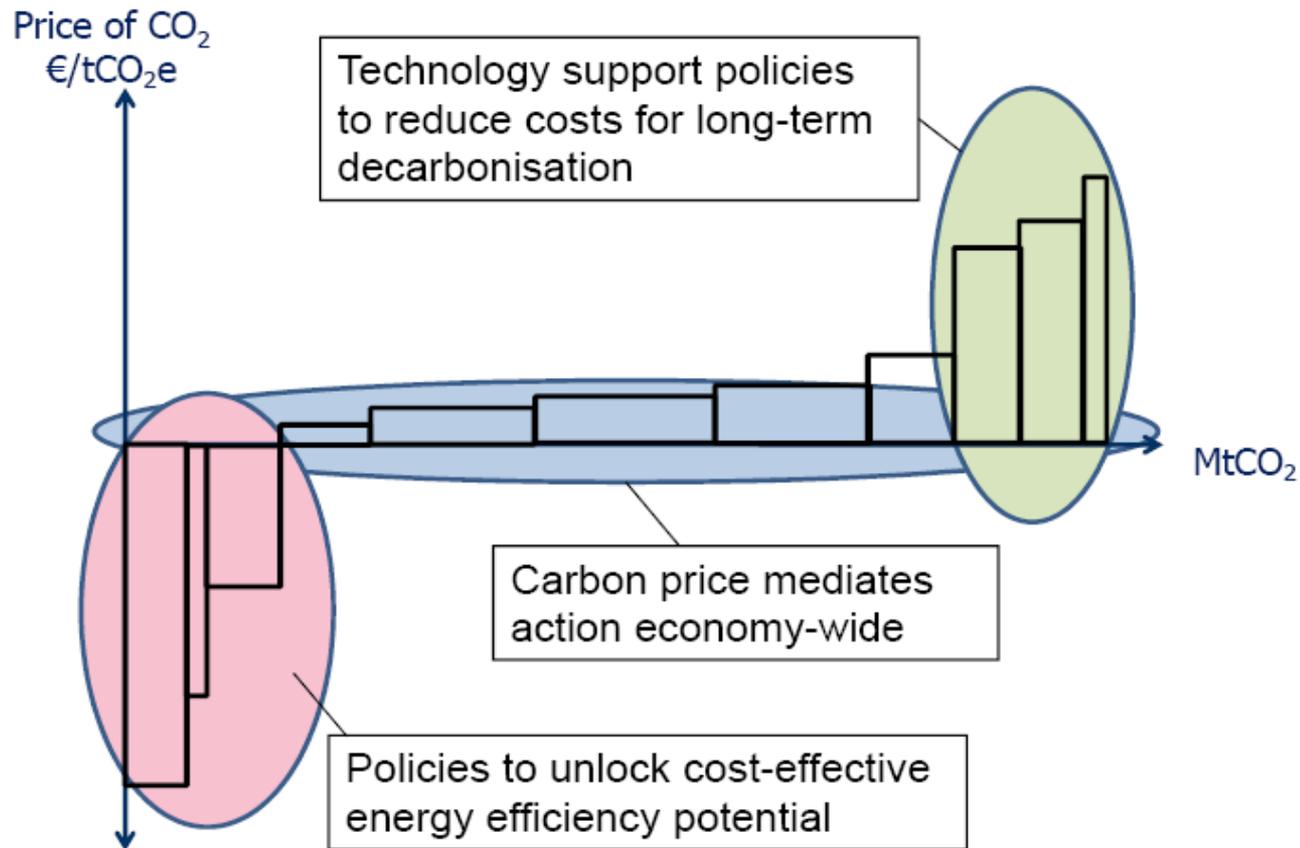
- A carbon tax is a means by which government can intervene by way of a market based instrument to appropriately take into account the social costs resulting from carbon emissions.
- A carbon tax seeks to level the playing field between carbon intensive (fossil fuel based firms) and low carbon emitting sectors (renewable energy and energy efficient technologies).
- Although this option does not set a fixed quantitative limit to carbon emission over the short term, a carbon tax at an appropriate level and phased in over time to the “correct level” will provide a strong price signal to both producers and consumers to change their behaviour over the medium to long term.
- “The introduction of a carbon price will change the relative prices of goods and services, making emission-intensive goods more expensive relative to those that are less emissions intensive. This provides a powerful incentive for consumers and businesses to adjust their behaviour, resulting in a reduction of emissions”.

(Carbon Pollution Reduction Scheme, Australia’s Low Pollution Future, White Paper Volume 1, December 2008, page xxviii)

Carbon Pricing and Energy Policy

- Carbon Tax as a proposed carbon pricing mechanism
- There is need for a complementary use of carbon pricing and low carbon energy policies on the path to a low carbon economy as on their own they might fail to sufficiently incentivise the least-cost decarbonisation.
- Energy policies - the Integrated Resource Plan (IRP, 2010) prescribes the energy mix for the country, Renewable Energy & Energy Efficiency Programmes aim to incentivise uptake of low carbon energy generation and enhancement of energy efficiency measures

The Core Policy Mix – a carbon price, energy efficiency and technology policies (IEA 2011)



Competitiveness impacts

- Potential adverse impacts on international competitiveness of trade exposed industrial sectors.
- Carbon tax seeks to:
 - Level playing field between carbon intensive (fossil based firms) and low carbon emitting sectors.
 - Result in a contraction in the long run of carbon intensive sectors and contribute to net ghg emissions reductions.
- First mover competitive advantage gains:
 - Early adoption of low carbon intensive growth path can result in competitive advantage in low carbon technologies
 - Incentives created for research, development, innovation etc.
- Measures to mitigate competitiveness impacts could include:
 - Longer period of phasing in of the tax rate

Border tax adjustments (BTAs)

- BTAs forms part of policy proposals by developed countries targeted at countries not participating in global emissions reduction agreements.
- What are BTAs?
 - Taxing imports according to emissions associated with their production at the same carbon price as domestically produced goods and services.
 - Imports will be taxed at a rate equal to the “domestic” carbon tax / carbon price.
- BTA’s seek to achieve two objectives:
 - Provide competitiveness offsets for domestic producers.
 - Address possible carbon leakage concerns – reduction of emissions in a taxing country results in increases in emissions in other countries.
- BTA’s
 - Will impact negatively on countries that don’t take appropriate action to price carbon.
 - Might also impact negatively on global trade.

Carbon Tax: Design Considerations

1. Carbon Emissions Tax

Actual measured emissions; or

1. Proxy tax bases:

A. Fossil Fuel Input (Upstream):

where fuels enter the economy based on the carbon content of the fuel.

B. Output Tax (Downstream):

(i) At point where fuel is combusted.

(ii) May be based on average emissions of production processes.

Proposed carbon tax design features (1)

- A carbon tax at R120 per ton of CO₂e above the suggested thresholds with annual increases of 10 per cent until 2019/20 is proposed as from 1 January 2015.
- A basic tax-free threshold of 60 per cent is proposed.
- Additional tax-free allowance for process emission (10%)
- Additional relief for trade-exposed sectors (max 10%)
- Carbon offsetting allowed to reduce carbon tax liability (max 5% or 10%)
- The overall tax-free allowance for an entity will be capped at 90 per cent of actual verified emissions.
- Tax-free thresholds will be reduced during the second phase (2020 to 2025) and may be replaced with absolute emission thresholds thereafter.

Budget 2012: Proposed carbon tax design features: (2)

Table C.13 Proposed emissions thresholds for sectors

Sector	Basic tax free threshold (%) below which no carbon tax will be payable during the first phase (2013 to 2019)	Maximum Additional allowance trade exposure	Additional allowance for “process” emissions	Total	Maximum offset percentage
Electricity	60%	-	-	60%	10%
Petroleum (coal to liquid)	60%	10%	10%	80%	5%
Petroleum – oil refinery	60%	10%	10%	80%	5%
Iron and steel	60%	10%	10%	80%	5%
Aluminium	60%	10%	10%	80%	5%
Cement	60%	10%	10%	80%	5%
Glass & ceramics	60%	10%	10%	80%	5%
Chemicals	60%	10%	10%	80%	5%
Pulp & paper	60%	10%	0%	70%	10%
Sugar	60%	10%	0%	70%	10%
Agriculture, forestry and land use	60%	-	40%	100%	0%
Waste	60%	-	40%	100%	0%
Fugitive emissions: coal	60%	10%	10%	80%	5%
Other	60%	10%	-	70%	10%

Proposed carbon tax design features (3)

- A formula is proposed to adjust the basic (60%) percentage tax-free threshold to take into account efforts already made by firms to reduce their emissions and to encourage firms to invest in low-carbon alternatives. The basic percentage threshold below which the tax will not be payable may be adjusted using a carbon emissions intensity factor for output compared to an agreed sector benchmark. A formula is proposed to calculate a factor Z, which will then be used to adjust (increase or decrease) the basic percentage tax-free threshold as described below:
- $Z = Y / X$
 - X is the average measured and verified carbon intensity of the output of a firm.
 - Y is the agreed benchmark carbon intensity for the sector.
- The adjustment to the tax-free threshold is then determined by multiplying the 60 percentage threshold by Z.
- The overall tax-free allowance for an entity will be capped at 90 per cent of actual verified emissions.

Energy sector & carbon pricing

- Pricing energy appropriately is important to ensure that the external costs of climate change and other environmental damages are reflected in the price of energy and that the relative prices between carbon intensive and low carbon technologies are correctly reflected.
- The current regulatory framework for determining the prices of liquid fuels (petrol, diesel, paraffin and gas) does not allow for a pass-through – either in full or in part – of the carbon tax imposed at refinery level. The electricity sector is however able to pass on the carbon tax to final consumers.
- Some consideration hence must be given to the pass through mechanism of the carbon tax to ensure that appropriate incentives are maintained for changes in both production and consumption patterns.
- The tax will nevertheless influence future investment decisions and reduce the price-cost differentials between fossil fuel-based electricity, nuclear energy and renewable energy.

Energy Efficiency Policies

- Energy Efficiency Strategy for South Africa, introduced in 2005, set aspirational targets for sector energy efficiency improvements as well as outlined several energy efficiency policy measures to be introduced.
- A national energy intensity reduction target of 12% by 2015 for all users of energy has been set. Additional energy efficiency improvement targets of 15% by 2015 for industry; mining; power generation; transport; and commercial & public buildings; and 10% for residential sector were set.
- Key policy measures include:
 - Energy Efficiency and Demand Side Management Programme
 - Energy Efficiency Tax Incentive
 - Revised National Building Regulations
 - Adoption of Energy Management System Standards (ISO 50 001)
 - Public Transport Programme

Electricity generation levy

- The levy implemented on 1 July 2009 on the production / generation of electricity from non-renewables including coal, petroleum-based fuels, natural gas and nuclear. The objectives were:
 - Complement demand side management efforts
 - As a first step towards developing a carbon tax to achieve long term climate change objectives
- Electricity generated from renewables and qualifying cogeneration are excluded from the levy
- Now also incorporate provision for the funding of energy savings measures such as the SWH, previously included in the electricity tariff and funding to rehabilitate some of the roads that were damaged due to the large volumes of coal trucks in one of the Provinces.
- To ensure the effective pricing of carbon and facilitate the structural change currently taking place in the energy sector, a gradual phasing-down and restructuring of the current electricity levy will be considered

Revenue recycling

- In general, “full” earmarking of specific tax revenue streams are not in line with sound fiscal management practices. However, the efficient recycling of revenue is important.
- Revenue recycling mechanisms for structural adjustment:
 - **“soft” earmarking** (on budget allocations): Independent Power Producers programme to incentivise renewable energy uptake, Electricity Demand Side Management programme, enhanced free basic energy / electricity programme, Carbon Capture and Storage rebate
 - **tax shifting**: reducing or not increasing other taxes (potential phasing-down of the electricity levy)
 - a range of environmental **tax incentives**, including Energy efficiency savings tax allowance

Revenue Recycling (2) - Tax Incentives

- **Tax exemption for revenues earned from CERs (CDM projects)**
- **Accelerated depreciation allowances** for renewable electricity generation and biofuels production
- **R&D tax incentives (including green technologies)**
 - 150 per cent income tax deduction for R&D operation expenses
 - accelerated depreciation (50, 30, 20)
- Tax incentives for **biodiversity conservation**
- **Energy efficiency savings** tax allowance

Revenue Recycling (3)

Other transitional support measures

- Under the **National Climate Change Response White Paper**, several **priority flagship programmes** have been identified in the **energy, transport, water and waste sectors**.
- To complement these initiatives, consideration will be given to support for households and business as detailed below:
- **Households**
 - enhanced free basic energy / electricity
 - improved public transport
- **Businesses**
 - tax relief for CER credits
 - Research and development tax incentive
 - Implementation of the energy efficiency savings tax incentive
 - Carbon Capture and Storage rebate

Concluding remarks

- A carbon tax that is implemented gradually and complemented by effective and efficient revenue recycling can contribute to significant emissions reductions,
- A carbon tax will be introduced as part of a package of interventions to ensure that the primary objective of GHG mitigation is achieved,
- Minimise potential adverse impacts on low-income households and industry competitiveness

Thank you

Any Questions?

Questions

- Impact on electricity prices, given the already high increases in electricity prices
- Impact of higher electricity prices on households (distributional impact) and businesses (competitiveness)
- Impact on jobs and economic growth
- The effectiveness of a carbon tax given the IRP – regulatory / mandatory prescription about the energy mix
- What about the use of border tax adjustments / border carbon adjustments
- Impact on trade – “green protections measures”
- The most appropriate timing given the current economic climate
- Do we have to wait for a global agreement on carbon pricing
- Although South Africa is one of the top 20 GHG emitters it is still a small player, less than 2 % of global emissions
- Can we talk about a green growth strategy without pricing carbon
- International aviation & maritime
- Carbon budgets

Green Growth, Green Economy (1)

- “A Green Economy is one in which business processes are configured or reconfigured to deliver better returns on natural, human and economic capital investments, while at the same time reducing greenhouse gas emissions, extracting and using fewer natural resources, creating less waste and reducing social disparities”.
- “Thus, a Green Economy grows by reducing rather than increasing resource consumption”.
- “We have committed ourselves to our people as a government to work towards an inclusive, green, and sustainable growth. However we are not waiting for an agreement in Durban before achieving green, sustainable and inclusive growth”.
- “We are forging ahead with our programme of greening the economy to improve the economic, social and environmental resilience of the country in the face of climate change”.

Green Growth, Green Economy (2)

- “Africa and many developing countries boast most exciting opportunities for green growth, by virtue of their largely abundant natural resources. There are many initiatives that we can pursue together to protect the future, while not destroying industries and jobs”.
- “In promoting this new green, sustainable and inclusive growth focus, we are putting together some policy proposals that will impact on the business sector”.
- “These may include putting a price on carbon and other pollution or on the over-exploitation of a scarce resource through mechanisms such as taxes, natural resource charges or tradable permit systems”.
- “Let me reiterate that we see in the threat of climate change, an opportunity to develop our green, inclusive, sustainable and shared growth”.
- “This would be growth that provides jobs and which improves infrastructure, health, education and all basic services that our communities need to have an improved quality of life”.

- *Source: President Jacob Zuma, The World Climate Business Summit, Elangeni Hotel, Durban, 03 December 2011*

International carbon pricing developments

- The Climate Commission; by 2013, 33 countries & 18 sub-national jurisdictions will have a carbon price in place
- **China:** pilot cap & trade programs in 7 key cities & provinces from 2013;
- **India:** introduced a nationwide carbon tax of 50 rupees per ton (less than Aus\$1) of coal both produced & imported in July 2010;
- **Costa Rica:** a tax on carbon pollution was enacted in 1997, set at 3.5 % of the market value of fossil fuels & revenue goes into a national forest fund which pays indigenous communities for protecting the forests around them
- **South Korea:** introduced a carbon tax in 2008 & has ETS set for January 2015 covering facilities producing >25,000 ton GHG emissions.

International carbon pricing developments (2)

- **Japan:** introduced carbon tax in 3 phases from 1 October 2012 through increasing existing taxes on fossil fuels (coal and LPG/LNG) at a rate of ¥289 (\$Aus 3.30)/ ton
- **Australia:** carbon tax came into effect 1 July 2012 with a fixed price for first 3 years at a rate of Aus\$23/ ton and moving to ETS 1 July 2015;
- **Canada:** no federal carbon tax, but existing carbon taxes in Quebec and British Columbia. Alberta implemented ETS in 2006 and Quebec's scheme will start in 2013;
- **The EU:** has an ETS covering 45% of GHG in Europe
- **Finland-** world's first carbon tax in 1990, initially with exemptions for specific sectors & price €20/ tonCO₂ in 2010
- **Denmark:** introduced in 2002 at a rate of 100 DKK (US\$18/MtonCO₂).

Energy Efficiency Savings Tax Incentive

- Aimed at helping to address climate change related challenges through improvement in energy use and address energy security concerns
- The value of the incentive (i.e. a tax deduction) is 45 cents per kwh saved
- Taxpayers that can prove EES from implementing an energy efficiency measures can claim the allowance
- Only accredited measurement and verification professional can verify the EES
- The South African National Energy Development Institute (SANEDI), a government agency, is responsible for endorsing and issuing EES certificates
- The taxpayer baseline is adjusted annually with the amount of EES claimed
- The legislation is already in place and the Regulations to effect the incentive await publication
- The EES incentive will run until January 2020
- It is complementary mechanism (i.e. carrot) in anticipation of the implementation of the proposed carbon tax. Some of the carbon tax revenue will be recycled through this EES Tax Incentive

MYPD3 – Electricity prices

NERSA - Allowed: Rand million	2013/14	2014/15	2015/16	2016/17	2017/18	TOTAL	
Return	23,477	26,511	26,436	27,657	33,667	137,748	
Primary energy costs	51,067	54,966	56,779	62,060	68,620	293,492	
Independent Power Producers	2,686	5,108	14,826	19,269	23,018	64,907	
Depreciation	25,733	27,481	28,564	28,911	29,197	139,886	
Integrated Demand Management - EE & SWH	1,455	953	819	712	1,244	5,183	
Operating costs	45,519	48,565	52,908	57,769	60,576	265,337	
Total Allowable Revenues	149,937	163,584	180,332	196,378	216,322	906,553	
Eskom - Requested: Rand million	2013/14	2014/15	2015/16	2016/17	2017/18	TOTAL	
Return	7,271	14,643	31,187	51,878	81,885	186,864	
Primary energy costs	62,328	65,368	69,657	75,330	82,266	354,949	
Independent Power Producers	5,189	13,302	18,043	20,143	21,042	77,719	
Depreciation	30,792	34,631	37,076	39,669	43,218	185,386	
Integrated Demand Management - EE & SWH	2,941	2,709	1,862	1,966	3,612	13,090	
Operating costs	44,875	48,952	54,934	59,346	61,478	269,585	
Total Allowable Revenues	153,396	179,605	212,759	248,332	293,501	1,087,593	
NERSA - ESKOM: Rand million	2013/14	2014/15	2015/16	2016/17	2017/18	TOTAL	
Return	16,206	11,868	(4,751)	(24,221)	(48,218)	(49,116)	-26%
Primary energy costs	(11,261)	(10,402)	(12,878)	(13,270)	(13,646)	(61,457)	-17%
Independent Power Producers	(2,503)	(8,194)	(3,217)	(874)	1,976	(12,812)	-16%
Depreciation	(5,059)	(7,150)	(8,512)	(10,758)	(14,021)	(45,500)	-25%
Integrated Demand Management - EE & SWH	(1,486)	(1,756)	(1,043)	(1,254)	(2,368)	(7,907)	-60%
Operating costs	644	(387)	(2,026)	(1,577)	(902)	(4,248)	-2%
Total Allowable Revenues	(3,459)	(16,021)	(32,427)	(51,954)	(77,179)	(181,040)	-17%

MYPD3 – Electricity prices

	2013/14	2014/15	2015/16	2016/17	2017/18
Allowed revenues from tariffs based sales - Rmn	142,746	155,477	171,838	189,396	209,025
Forecast sales to tariff customers: (GWh)	217,890	219,744	224,877	229,495	234,519
Standard average price (c/kWh)	65.51	70.75	76.41	82.53	89.13
Percentage price increase (%)	8%	8%	8%	8%	8%
Total expected revenues from aa customers -Rmn	149,937	163,584	180,332	196,378	216,322

GHG Inventory, 2000 (DEA)

	GHG emissions - 2000	Mt CO2e (A)	Mt CO2e (B)	%	
1	Fuel combustion		265 245	57.5%	
	a. Electricity generation	179 436			
	b. Petroleum refining	39 965			
	c. Chemicals	17 480			
	d. Iron & Steel	15 957			
2	Fugitive emissions (Oil, Coal mining)		71 177	15.4%	
3	Transport		42 232	9.2%	
	a. Road transport	39 511			
4	Agriculture, forestry and land		41 053	8.9%	
5	Industrial Processes	32 079	32 079	7.0%	
6	Waste		9 393	2.0%	
	Total (1)	(70%)	324 428	461 179	100.0%
	Land (sequestration)		-20 560		
	Total (2)		440 619		



Modelling carbon tax impacts (1)

- Several studies modelled potential impacts of a carbon tax – UP, the World Bank, LTMS, NT
- NT model scenario– R100/ tonCO₂e upstream tax based on emission intensities of fossil fuel inputs; recycling through CIT, PIT, VAT, transfers and government investments
- Impacts on emission reductions, competitiveness & performance of different sectors of the economy, employment, investment, income inequality and overall output
- Baseline (BAU) centred on IRP2 revised balanced scenario – ~4% economic growth, no new tax increases etc.
- Carbon-intensive industries' costs > less carbon-intensive e.g. mining (primary sector) and the petroleum sector penalised while greener industries rewarded

Modelling carbon tax impacts (2)

- Impact on output ranges between -0.14 to 0.54 of GDP in 2035 depending on recycling option
- Impact on employment is through sector output and composition – labour intensive sectors benefit
- Carbon tax shown to affect capital and energy-intensive sectors; rents of which accrue to the top deciles of income distribution hence not necessarily regressive if transfers chosen as recycling option
- Besides the environmental benefits, first-mover advantages with carbon-sensitive countries makes SA more favourable trade partner
- SA's better off taking pre-emptive mitigation strategies than reacting to BTA/foreign carbon pricing (Alton et al. 2012)

Modelling carbon tax impacts (3)

- Devarjan et al. (2009) CGE model - relative substitutability of energy inputs with capital, 15% CO₂ emission reduction, revenue recycled through household lump-sum transfers;
- Tax rate of R96 - 105/tonCO₂e either tax on carbon content, excise tax on energy inputs or sales tax on energy-intensive sectors (sales tax);
- Carbon tax imposes lowest distortion in comparison, 0.3% of household welfare (sales tax 10 times worse); -0.2% of GDP (sales tax - 1.47%GDP);
- Revenue recycling lowers welfare loss by around 30%;
- best option in terms of consistency & aggregate efficiency is carbon tax followed by excise tax on energy inputs & finally the sales tax on energy-intensive sectors.

National Climate Change Response White Paper: Finance and Flagship Programmes

- **Financing National Climate Change Response Policy** and long term funding framework for climate change:
 - Mainstream climate change response into the fiscal and budgetary process and so integrate the climate change response programmes at national, provincial and local government and at development finance institutions and state-owned entities.
- **Near Term Priority Flagship Programmes for:**
 - Climate Change Response Public Works
 - Water Conservation and Demand Management
 - Renewable Energy
 - Energy Efficiency and Demand Side Management
 - Transport
 - Waste Management
 - Carbon Capture and Storage
 - Adaptation Research

2012 MTEF allocations per sector

Sector/Function	2012/13 R'000	2013/14 R'000	2014/15 R'000	Total MTEF R'000
Energy	3 230 811	3 497 368	3 786 561	10 514 740
Water and Sanitation	3 736 040	4 186 519	4 681 463	12 604 022
Environment	1 739 699	2 106 310	1 748 418	5 594 427
Transport	4 988 103	5 549 981	5 870 846	16 408 930
Disaster Management	510 000	540 000	572 400	1 622 400
Climate change Programmes	31 186	33 016	34 956	99 158
Biodiversity	486 367	511 361	541 597	1 539 325
TOTAL	14 722 206	16 424 555	17 236 241	48 383 002

Department of Transport

		Transport - National - Budget Allocations		
R' 000		2012/13	2013/14	2014/15
1	Departmental baseline	23,021,852	28,418,447	29,725,696
	<i>SANRAL: National Road Agency: Capital</i>	6,394,541	7,515,300	7,849,560
	<i>SANRAL: National Road Agency: Coal haulage</i>	648,910	665,498	696,111
	<i>PRASA: Passenger Rail Agency of SA</i>	7,481,110	10,710,959	13,865,547
	<i>Compensation of employees</i>	381,322	405,748	430,101
	<i>Other</i>	8,115,969	9,120,942	6,884,377
2	Conditional Grant to Local Government	5,589,135	5,912,264	6,184,228
	<i>Public Transport: Infrastructure & Network Operations</i>			
3	Conditional Grant to Provincial Government	13,093,000	13,735,539	14,367,374
	<i>Provincial Road Maintenance</i>	8,540,479	8,952,830	9,364,661
	<i>Public Transport Operation</i>	4,552,521	4,782,709	5,002,713
4	Net additions (e.g. PRASA)	571,313	156,960	3,100,381
5	TOTAL	42,275,300	48,223,210	53,377,679

DEA Programmes

- **Programme 1:** Administration is allocated R776m during 2012/13 financial year.
- **Programme 2:** Environmental Quality and Protection is allocated R346m in 2012/13, some of the funds will be used to improve air and atmospheric quality and improve compliance with legislative timeframes in terms of the National Environmental Management Air Quality Act and Waste Act (2008).
- **Programme 3:** Oceans and Coasts allocated R222m for ocean and coastal research and maintenance of the Polar research vessel
- **Programme 4: Climate Change** with a budget of R31m for the climate change management, mitigation and adaptation coordination.
- **Programme 5:** Biodiversity and Conservation with a budget of R486m. This included the renovation of accommodation and tourist facilities in the Kruger National Parks.

DEA – Programme 6

- **Programme 6: Environmental sector Programme and Projects** is allocated R2.7bn for 2012/13 financial year (includes EPWP projects).
- **Main Programmes:**
 - Working for Coast
 - Working for Water
 - LandCare
 - Working on Fire
- Natural Resource Management (NRM) is allocated R1.5bn, of which R1.1bn for **Working for Water** (WfW) and R341m for **Working on Fire** (WoF).
 - WfW: launched in 1995 aimed at removal of alien invasive species.
 - WoF aims to enhance the sustainability and protection of life, livelihoods, and ecosystem services through integrity fire management.
- National Resource Management (NRM) created 12 858 full time equivalent jobs against the target of 18 304 through EPWP projects during 2011/12 financial year.
 - NRM received an additional R230m (WfW R150m and WoF R80m) for FY12/13.

DEA: The Green Fund - DBSA

- Primary objective of the Green Fund is to provide catalytic finance for high quality, high impact green economy projects and mainstreaming activities which would not have been implemented without fiscal support. The Green Fund is additional and complementary to existing fiscal allocations supporting the greening of the South African economy.
- The Green Fund will respond to market weaknesses currently hampering South Africa's transition to a green economy by:
 - Promoting innovative and high impact green programmes and projects
 - Reinforcing climate policy objectives through green interventions
 - Building an evidence base for the expansion of the green economy, and
 - Attracting additional resources to support South Africa's green economy development.

Green Fund - Three funding windows

- **Green Cities and Towns**

Local government, through public sector procurement and alignment of spending on infrastructure and services, with environment performance indicators, can play a significant role in generating the demand for green products and services.

- **Low Carbon Economy**

The decoupling of economic growth from its impact on natural resources will be driven by private sector efforts to lower environmental impact and resource consumption. ---- interventions targeting industrial efficiency and the carbon intensity of the economy including energy efficiency, reducing pollution from industrial processes, waste management and reuse of by-products.

- **Environmental and Natural Resource Management**

The protection of biodiversity and securing the sustainable delivery of ecosystem services is the primary focus of this Window. These include interventions targeting ecosystem based adaptation to climate change that could drive rural development models. Managing and reducing the impact of agriculture and land use changes through demand management and resource conservation will be supported.

Tax revenue – 2012/13

Gross Tax Revenue		2012/13		
		Rand mn	%	Cumulative %
1	Personal income tax	275,805	33.9%	33.9%
2	Value added tax	215,840	26.5%	60.4%
3	Corporate income tax	158,947	19.5%	79.9%
4	Fuel levy	40,320	5.0%	84.9%
5	Custom duties	35,310	4.3%	89.2%
6	Specific excise duties	28,459	3.5%	92.7%
7	STC / WTD	19,739	2.4%	95.2%
8	Skills development levy	11,378	1.4%	96.6%
9	Transfer duty, STT, etc.	8,645	1.1%	97.6%
10	Electricity levy	7,984	1.0%	98.6%
11	Other	11,407	1.4%	100.0%
	TOTAL	813,834	100.0%	

Environmentally related taxes		
	R million	2012/13
1	General fuel levy	40,320
2	Air passenger departure tax	873
3	Plastic bag levy	152
4	Electricity levy	7,984
5	Incandescent light bulb levy	132
6	CO2 Vehicle emissions tax	1,568
	Sub Total	51,029
	TOTAL Tax Revenue	813,834
	Sub Total / TOTAL	6.3%

Fiscal policy to mitigate climate change: A guide to policymakers.

Michael Keen, Ian Parry and Ruud de Mooij (editors) IMF, 2012 forthcoming

- “.. carbon pricing should ideally form the centerpiece of mitigation efforts...”
- “Carbon pricing also strikes the cost-effective balance between different emission reduction opportunities because all behavioral responses are encouraged up to where the cost of the last tonne reduced equals the emissions price.
- Moreover, the carbon price provides a strong signal for innovations to improve energy efficiency and reduce the costs of zero- or low-carbon technologies.
- By definition, regulatory policies on their own, like mandates for renewable fuel generation and energy efficiency standards, are far less effective as they focus on a much narrower range of emission reduction opportunities.
- A reasonable minimum price to aim for seems to be around \$20 per tonne, under either least-cost climate stabilization or damage valuation approaches.
- Establishing a credible time path for progressively rising carbon prices is also important to create stable incentives for long-term, clean energy investments”.

Carbon Pollution Reduction Scheme

Australia's Low Pollution Future,

White Paper Volume 1, December 2008

- “The consequent economic cost (*of GHG emissions*) is not currently reflected in the costs of business or the price of goods and services – because firms face no cost from increasing emissions, the level of emissions is too great. **Unless businesses and individuals bear the full responsibility for their consumption and production decisions, the level of carbon pollution will remain too high (page xxv)**”.
- “Placing a limit, hence **a price**, on emissions has the potential to change the things we produce, the way we produce them, and the things we buy (page xxvi)”.
- “The introduction of a carbon price will change the relative prices of goods and services, making emission-intensive goods more expensive relative to those that are less emissions intensive. This provides a powerful incentive for consumers and businesses to adjust their behaviour, resulting in a reduction of emissions (page xxviii)”.



Environmental taxes - Political Economy Concerns

- “ ... a political impediment to the introduction of environmental taxes is the argument that they harm international competitiveness. Partly as a result of concerns regarding international competitiveness, many proposals for environmental taxes have been made at the international level. For example the European Community has proposed that a carbon tax be introduced in its member countries, but its implementation is dependent on other major countries introducing measures with comparable effect. These international agreements are inevitably difficult to complete”.
- David C . L. Nellor, Environmental Taxes, in Tax Policy Handbook, edited by Parthasarathi Shome, International Monetary Fund (IMF), page 111 (1995).

Saving the planet, A tale of two strategies by Roger Martin and Alison Kemper. (1)

Harvard Business Review, April 2012 (pp. 48-56)

- Thomas Malthus advised restraint; Robert Solow promotes innovation. Let's pursue both to solve the environmental crisis.
- The Kyoto Protocol provides a cautionary tale. Its framers, using an implicitly Malthusian conceptual structure, hoped that measuring and pricing carbon emissions would encourage incremental **reductions**. But they also hoped that gradually increasing the cost and decreasing the amount of emissions allowed would generate Solovian **innovation** in alternative energy systems and products along with carbon trading.
Kyoto has produced little of either.
- Instead we have created expensive new industries devoted to auditing emissions, assessing the ability of tropical forests to absorb carbon, and burying liquid CO₂ in abandoned mines. Our economies are still locked into burning fossil fuels, and the concentration of CO₂ in the atmosphere continues to rise.

Saving the planet, A tale of two strategies by Roger Martin and Alison Kemper. (2)

Harvard Business Review, April 2012 (pp. 48-56)

- The world's leading environmental economist, William Nordhaus, has termed Kyoto's mechanisms "inefficient and ineffective" and urged their replacement with a global carbon tax that would force consumers and companies, not governments, to innovate (pp. 52-53).
- The biggest challenge for innovation in energy is that substantial vacillation in the price of oil, which discourage large-scale investment in substitutes. The carbon offset pricing featured in cap-and-trade programs, which does nothing to dampen profitability swings for alternative technologies, is therefore not the answer. Far preferable would be a variable gap-filling carbon tax to preserve a floor price for a barrel of oil.
- The European Automobile Manufacturers' Association has advocated that "CO₂ should be the key criterion for taxation to provide incentives to buy lower CO₂ emitting cars." At a minimum, corporations can help by not fighting governmental attempts to create such a context.

Saving the planet, A tale of two strategies by Roger Martin and Alison Kemper. (3)

Harvard Business Review, April 2012 (pp. 48-56)

- The key factor determining its success is a broad commitment to reduce, reuse, and recycle, which holds for both individuals and corporations. That commitment is generated essentially in three ways: regulation, economic incentives, and social or moral pressure (p.54).
- Mixing regulation with economic incentives can give history a shove.
- .. responsible energy consumption need not imply long-term restraint in economic growth. Rather, government should intervene to create pricing conditions that reward companies for innovation. That is what the German government did with solar energy. If governments pour their resources into regulation and subsidies in an effort to change behaviour rather than stimulate new technologies, society may be worse off. Similarly, if corporations are motivated to make existing technologies more efficient only in small increments, they will miss out on the quantum leap in productivity that disruptive innovation can bring.
- Malthusian restraint can buy time for Solovian innovation (p. 56).

Written comments (79) – 2010 paper

No	Comments received from:	Organisation
1	Chris Zweigenthal (Chief Executive)	Airlines Association of Southern Africa (AASA)
2	Zohra McDoolley-Aimone	ALSTOM - South Africa
3	Godfrey Gomwe (Executive Director)	Anglo American South Africa
4	Dirk van Vuuren (Group Tax Manager)	ArcelorMittal
5	Dr Dhiraj Rama (Executive Director)	Association of Cementitious Material Producers (ACMP)
6	Laurraine Lotter	Business Unity South Africa (BUSA)
7	Mary Jean Thomas-Johnson	Cape Chamber of Commerce
8	Oliver Stotko (Environmental Engineer)	Carbon & Energy Africa (Pty) Ltd
9	Wiebe van der Laan	Carbon Credit Creations
10	Roger Baxter	Chamber of Mines of South Africa
11	Laurraine Lotter	Chemical and Allied Industries Association (CAIA)
12	Tandokazi Nquma	COEGA
13	Yvette Abrahams (Commissioner)	Commission For Gender Equality
14	Dr Hanlie Kotzé	Consensi Consulting
15	John Bexley	Consol Glass
16	Dr Rodney Milford	Construction Industry Development Board (cidb)
17	Anton Nahman	CSIR: Natural Resources and the Environment
18	David Silverstein	David Silverstein (individual comments)
19	RD Hughes (General Manager)	Duferco Steel Processing (Pty) Ltd
20	Amar Sooklal	Durban Chamber of Commerce and Industry
21	Tristen Taylor	Earth life Africa
22	Leena Ackbar	ECA Consulting
23	Alan Murphy	ECOPEACE
24	Mansoor Parker	Edward Nathan Sonnenbergs Inc
25	Prof Philip Lloyd	Energy Institute, Cape Peninsula University of Technology
26	Prof. Harald Winkler	Energy Research Centre, University of Cape Town

Written comments – 2010 paper

27	Stephen Law (Director)	Environmental Monitoring Group (EMG)
28	Mark Heaton	Envirotrade Carbon Limited
29	Willie Du Plessis (Gen Manager-Legal)	Eskom
30	Emily Tyler	Emily Tyler & Brent Cloete - Climate Change Economists
31	Ernst Venter (Executive Gen Manager)	Exxaro
32	Lushen Govender	General Motors South Africa (GMSA)
33	BUSA	Genesis
34	Linden Bradfield	Global Railway Engineering
35	Manfred Braune	Green Building Council of South Africa (GBCSA)
36	Harmke Immink	Group Five
37	Dr. Miriam Altman	Human Sciences Research Council (HSRC)
38	Ian Parry	IMF
39	Andre Ferreira	Investment Property Databank (IPD) South Africa
40	Gerald Rudman (Director)	Imperial Logistics
41	Mike Rossouw (Chairman)	Industry Task Team on Climate Change (ITTCC)[1]
42	Andreas Hardeman	International Air Transport Association (IATA)
43	Kris Devan	Law Society of South Africa
44	Leandro Gastaldi, CFA	LLANDUDNO Fund Managers
45	Susanne Akerfeldt	Ministry of Finance Stockholm
46	Marthinus Van Schalkwyk, MP	Minister of Tourism
47	Jason Schäffler (Secretary General)	MTN Group Ltd
48	Valerie Geen	National Business Initiative (NBI)
49	Bernard van Rooyen (Director)	Northam Platinum Limited
50	Paolo Gianadda	PAMSA
51	Alison Futter	PetroSA

Written comments – 2010 paper

52	Richard Garlick	PFG Building Glass
53	Kyle Mandy (Head: National Tax Technical)	PwC
54	Jason Schäffler (Secretary General)	Renewable Energy Certificates South Africa (RECSA)
55	Duncan Ayling	RES
56	Sharmini Naidoo	Road Freight Association (RFA)
57	Norbert Behrens (Group Gen Manager- Strategy & Planning)	SASOL
58	Ivan Collair	Shell South Africa
59	Rob Baker	South Africa Travel Online
60	Dr (Prof) A D Surridge (Senior Manager: Advanced Fossil Fuel Use)	South African Centre for Carbon Capture and Storage (SACCCS)
61	Barry MacColl	South African Centre for Carbon Capture and Storage (SACCCS)
62	Chris Lötter	South African Chamber of Commerce and Industry (SACCI)
63	Liziwe McDaid	South African Faith Communities' Environmental Institute (SAFCEI)
64	Faith Ngwenya (Technical Executive)	South African Institute of Professional Accountants (SAIPA)
65	John Nel (Acting Gen Secretary)	South African Iron & Steel Institute (SAISI)
66	Marilyn Govender	South African Sugar Association (SASA)
67	Lorraine Wagner (Communication Officer)	Southern African Bitumen Association (SABITA)
68	Standford Mwakasonda	Stanford Mwakasonda (Individual comments)
69	Njabulo Mkhize	Steel & Engineering Industries Federation of South Africa (SEIFSA)
70	Ouma Rasethaba (Chief of Corporate Governance)	Telkom
71	Manfred Braune	The Green Building Council of South Africa (GBCSA)
72	Muneer Hassan (Project Director: Tax)	The South African Institute of Chartered Accountants (SAICA)
73	David Le Page	The Sustainability Action Movement
74	Peet du Plooy (Programme Manager: Sustainable Growth)	Trade & Industrial Policy Strategies (TIPS)
75	Nico Stolz	Tsb Sugar
76	Nishal Ramloutan	UBS Investment Bank
77	Aleksandra Tomczak (European Gen Manager)	World Coal Association (WCA)
78	James Macgregor	Worley Parsons
79	Richard Worthington (Manager: Climate Change Programme)	WWF

Comments (1a) – 2010 paper

- “I support the overall policy direction and favour a carbon tax over emissions trading”.
- “I fully share your analysis that inaction would not be environmentally, economically or politically sustainable. The world is moving towards a common price on carbon. Even if multilateral negotiations had to fail, tariffs on imports from countries with no emissions controls will likely become a reality. A more stringent and punitive global climate regime creates the risk of uncompetitive or even stranded assets in 20 or 40 years’ time, and, in the shorter term, the country’s exporters could face new tariff barriers as a result of the carbon embedded in their exports”.
- Consider all revenue recycling options
- A tax has a clear advantage if the policy priority is price stability, providing long-term policy signals to investors; transparency of pricing; stability of fiscal revenues, and an economy-wide coverage of emissions, and, given the existing administrative tax collection efficiency, entails lower transaction costs as well”.

Comments (1b) – 2010 paper

- “.... emissions’ trading requires a competitive market with a relative large number of market players. High market concentration like we find in SA would distort economic efficiency, and is likely to lead to price manipulation”.
- “The potential for linking markets (and the spectre of border trade measures in their absence) means that the option of cap-and-trade should not be definitively rejected. Should the international climate change negotiations evolve to such an extent that domestic emissions trading regimes are linked, South Africa may well wish to consider ways in which a tax regime can either be linked to such an international regime, or be regarded as a first step in a staggered approach”.

Comments (2a) – 2010 paper

- “The paper on carbon tax is considered too theoretical and does not take sufficient cognizance of South African circumstances to balance the need to reduce greenhouse gasses while keeping the economy on a job creating growth path. Rather, it is a one one-dimensional focus on generating tax revenue with potentially major negative implications for the country. The paper does not consider the broad range of regulatory and market mechanisms available to reduce greenhouse gas emissions in the country. While it mentions some of the other options available, the Paper focuses on the carbon tax option rather than being what is need at this stage, a policy paper, which set out the range of policy options that could be used to reduce carbon emissions”.
- “There is also the question of the extent to which South Africa, as a developing country with significant developmental challenges, should take the lead in aggressively mitigating emissions, particularly in the absence of a global climate change agreement”.
- “We ... strongly urges that Government expedite the implementation of the current tax allowance for energy efficiency savings and further accelerate budgetary support for renewable energy”.

Comments (2b) – 2010 paper

- “Business is of the opinion that South Africa does not need to take a global lead on this issue; rather the focus should be on job creation and development”.
- “In Denmark and the UK for example, an exemption regime exists under which companies or industry sectors can make voluntary commitments to reduce emissions in exchange for a tax exemption. This is a much more appropriate approach for a developing country, like South Africa, which will not have a legally binding reduction target”.
- “More research is required, taking into account international standards and benchmarking the effect that the proposed carbon tax will have on doing business in South Africa compared to doing business in other developing countries” (p.7).
- “The carbon tax proposals follow the same policy formulation process that has now been discredited in South Africa by starting with international benchmarks which are entirely first world based, ignoring the developing world context and then cherry picking lessons and policy implications for South Africa. The carbon tax proposal is not based on careful analysis of the local context but rather a combination of inappropriate international examples taken out of context”(p.3/4).

Comments (3a) – 2010 paper

- “It is crucial that there is policy coherence between government’s industrialization, growth, job creation, energy security and beneficiation policies and its policy on addressing climate change”.
- “The critical question is what to do about global warming, which will at the same time enable South Africa to realise its developmental, economic, energy security, beneficiation and job creation objectives? It would be unwise for South Africa to rush into a *front-runner* position of making firm carbon reduction commitments if a global agreement has not been reached and the major emitters of GHGs continue growing emissions unabated (the carbon leakage problem)”.
- “An effective response to climate change is not just about the policy content of the response, but the realistic sequencing of the introduction of measures to address climate change”.

Comments (3b) – 2010 paper

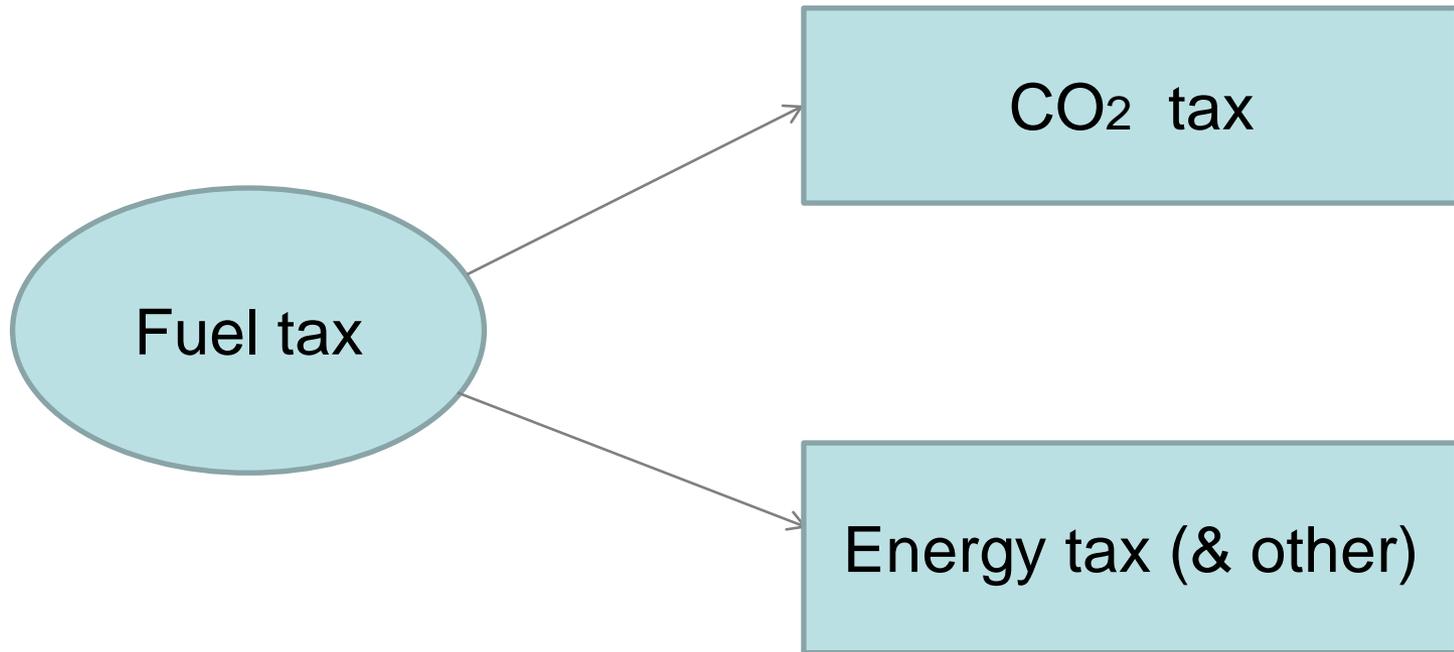
- “The ... believes that South Africa can be a world leader in addressing the challenge of GCC, but this does not mean the country has to be a front runner on firm CO₂ reduction targets or the immediate introduction of high carbon taxes. Rather, it would be appropriate to focus the effort on becoming a world leader in pushing for a global collective agreement, in creating a facilitative domestic environment for reducing the carbon intensity of the economy, by enabling the development of technologies that reduce GHG emissions while gradually introducing a comprehensive suite of measures intended to pragmatically tackle climate change”(p.3)

Comments (3c) – 2010 paper

- “At the international level many of South Africa’s major competitors have made limited progress on implementing carbon taxes. The cap and trade scheme in the USA has been rejected for the fourth time in seven years. Canada will not act until the USA scheme is agreed. The Australian CPRS system has been rejected and sent back to the drawing board. The European ETS only commences in 2013 and provides significant concessions to export industries.
- South Africa has just joined the BRICS grouping and only one of these countries has introduced a carbon tax (India). We must compare ourselves to our major international competitors and not just Europe” (p.7).
- “In the absence of a credit system, taxation of CO₂ at source would not incentivise carbon capture and storage” (p.9).

Possible revised liquid fuel tax regime –

1



CO₂ Emissions and Energy Content of Various Fuels

Fuel	CO ₂ emissions	Energy content
Petrol	2.34 kg/l	32 MJ/l
Diesel	2.61 kg/l	36 MJ/l
LPG	1.53 kg/l	24 MJ/l
Natural gas	3142 kg/tonne	53.2 MJ/kg
Ethanol	1.51 kg/l	21 MJ/l
Biodiesel	2.49 kg/l	33 MJ/l
CNG (@ 20 MPa)		9.3 MJ/l