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**REPUBLIC OF SOUTH AFRICA**

# **SOUTH AFRICA'S CLEAN TECHNOLOGY FUND INVESTMENT PORTFOLIO**

**PRESENTATION TO CTF TRUST FUND COMMITTEE**  
**27<sup>TH</sup> OCTOBER 2009**



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# SOUTH AFRICA'S CLIMATE CHALLENGE

- Impacts of climate change – predicted to be particularly serious for Africa and South Africa. Address this and at the same time reduce greenhouse gas emissions.
- South Africa is a responsible global citizen. In the interests of future growth and responsible development committed to addressing both
- Climate proofing development and low carbon growth path, key elements of guaranteeing sustainable development and poverty eradication





## ***Key impacts in Africa ~2020s-2050s***

- Between 75 and 250 million people will experience greater water stress by 2020
- Rain-fed agricultural yields could be reduced by up to 50% by 2020 in some countries
- 10-30% reduction in average river runoff and water availability by mid-century
- Drought affected areas will increase in extent
- Increased flood risk in high rainfall areas
- Changes in ecosystem structure and loss of biodiversity if temp increase  $>1.5-2.5^{\circ}\text{C}$
- Human health – possible changes in malaria transmission potential

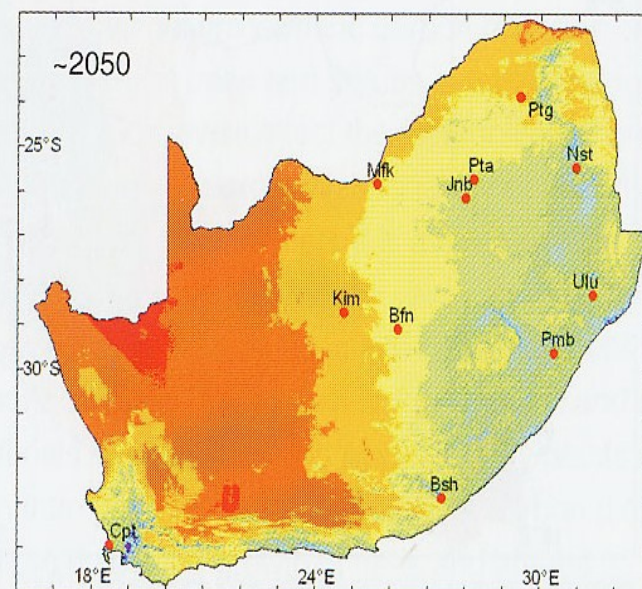
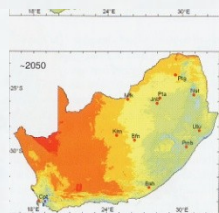
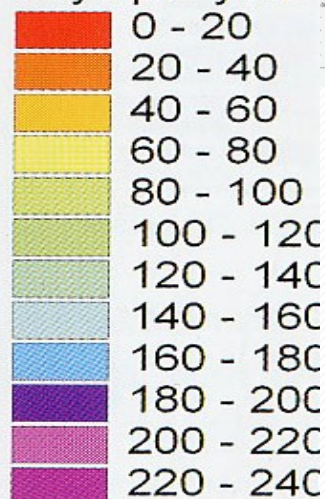




# FOOD SECURITY IN SOUTH AFRICA WILL BE IMPACTED

*The effect of global climate change on '**soil moisture days**' in South Africa  
(number of days when both soil moisture and temperature are suitable  
for plant growth)*

Favourable  
soil moisture  
Days per year

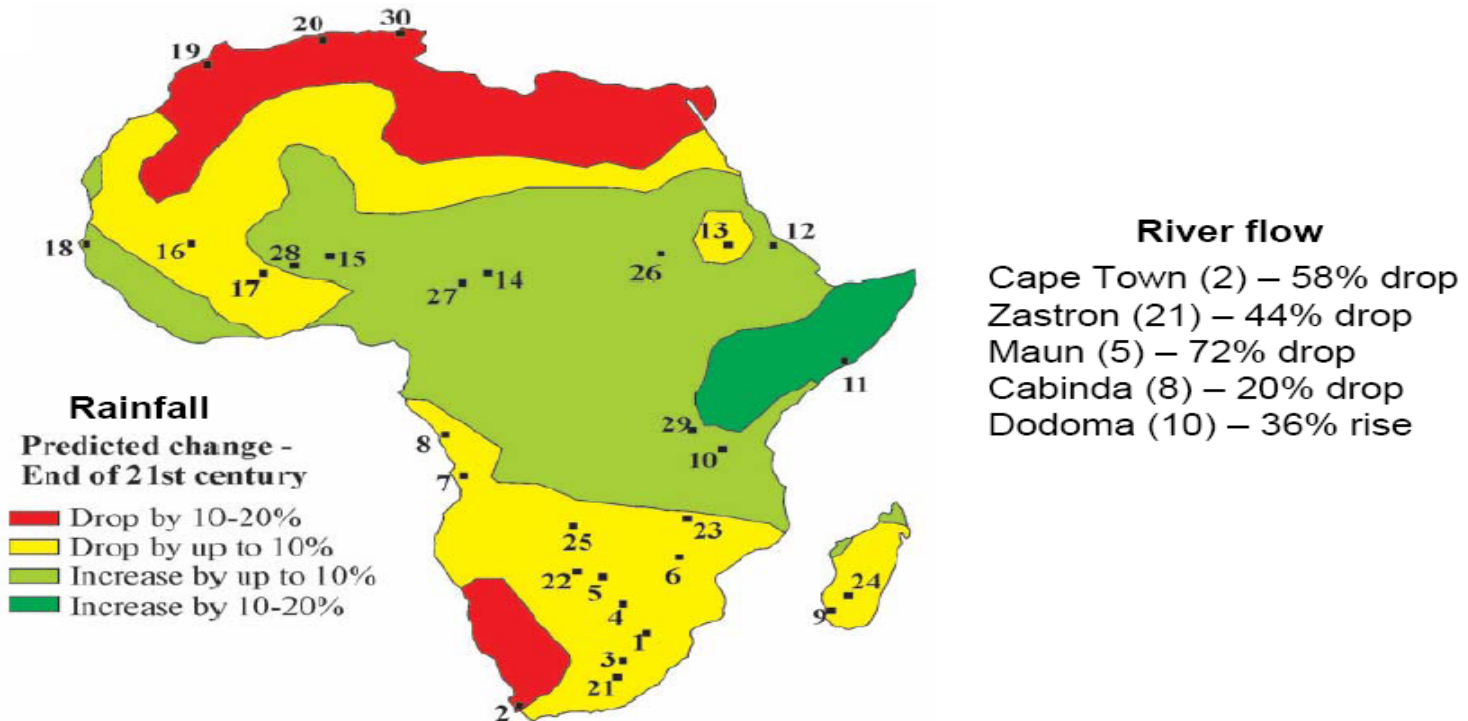


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# SOUTH AFRICAN RAINFALL AND RIVER FLOW

Rainfall and river flow change ~2050  
(consensus of 6 climate models, 2070-2099)



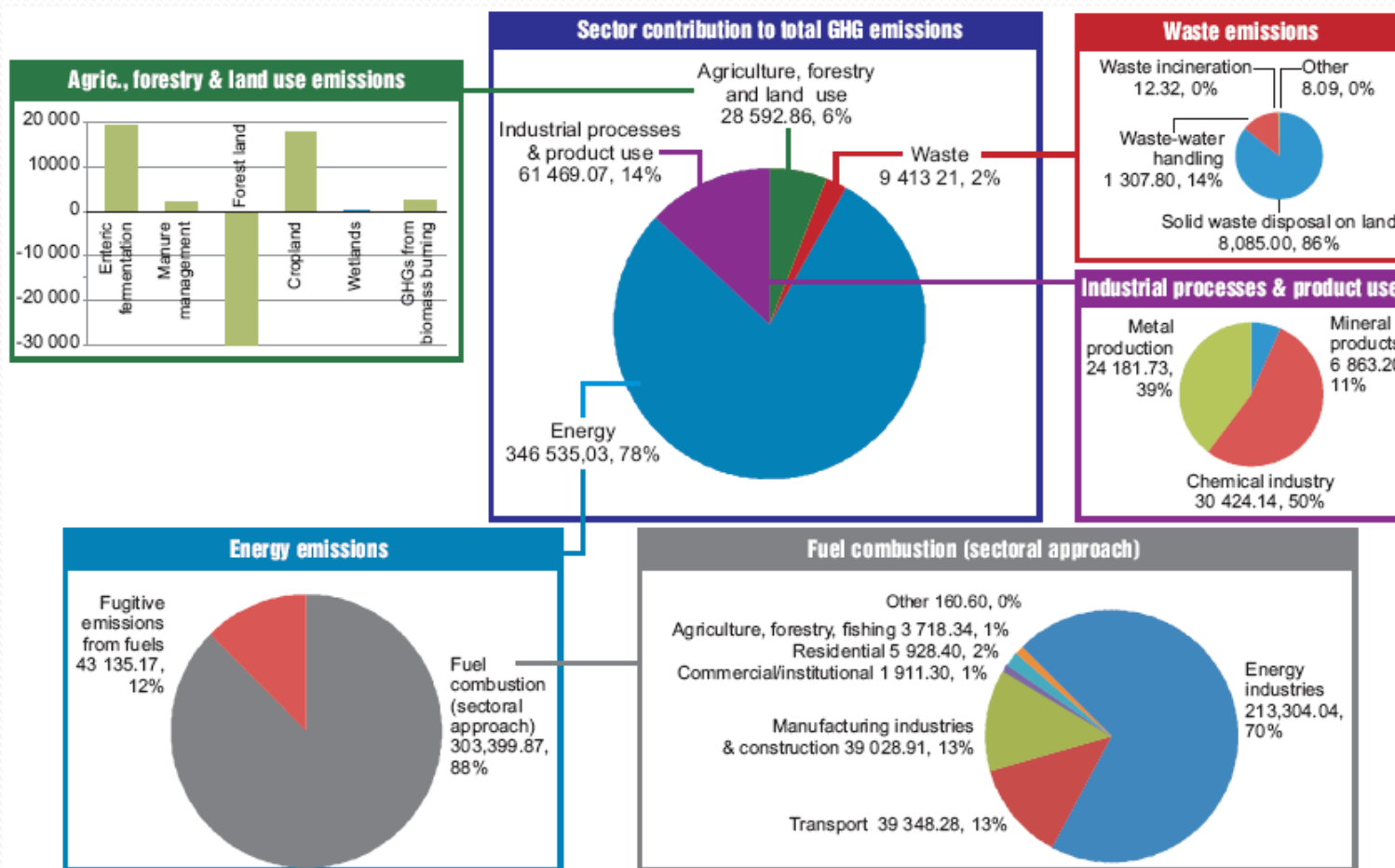
*De Wit et al 2006 Science*



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# THE MITIGATION CHALLENGE – THE SOUTH AFRICAN GREENHOUSE GAS EMISSION PROFILE - 2000



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# CHALLENGES FOR SOUTH AFRICA

- Coal based economy – coal plentiful and cheapest energy choice
- High emissions per capita & in total (top 20 emitter & contribute just < 50% of all Africa)
- Extremely vulnerable to impacts of climate change – latest science indicates impacts more serious than previously thought – particularly for water, agriculture and disaster management.
- Impacts of global economic crisis.



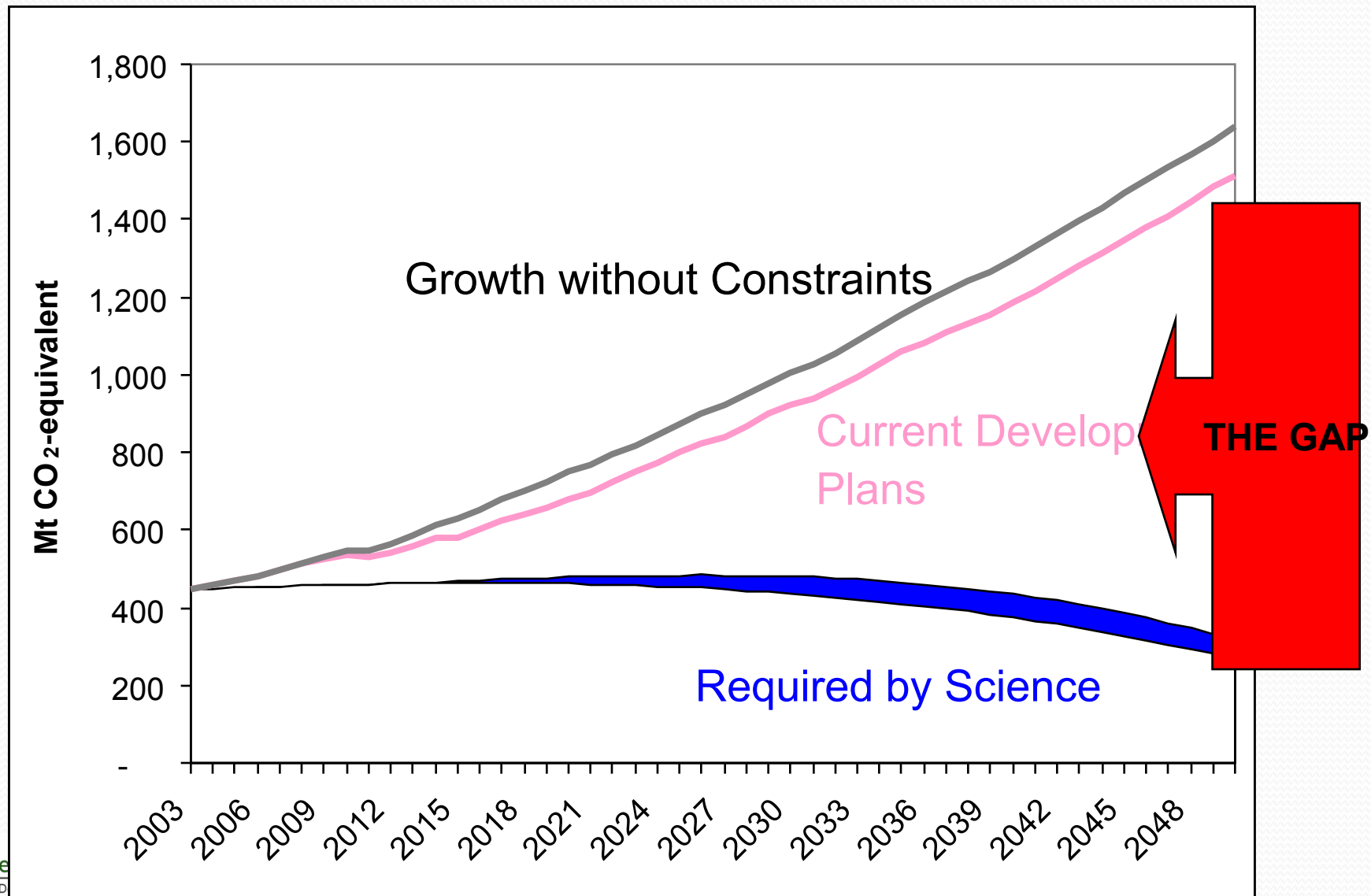
# SOUTH AFRICA'S MITIGATION RESPONSE

- Study of mitigation potential – Long Term Mitigation Scenarios, to inform policy and action
- Research based multi-stakeholder process that generates options
- Informs policy
- Provides clarity on possibilities and options
- Takes existing interventions as starting point

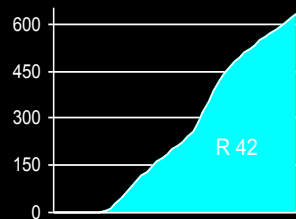




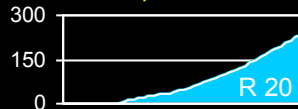
# TWO SCENARIOS FRAME THE CHOICE FOR SOUTH AFRICA



Escalating CO2 tax



Nuclear, extended



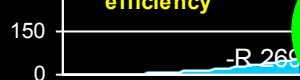
Electric vehicles with nuclear, renewables



Renewables, extended



Improved vehicle efficiency



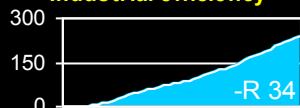
Subsidy for renewables



Renewables with learning, extended



Industrial efficiency



Nuclear



Renewables



SWH subsidy



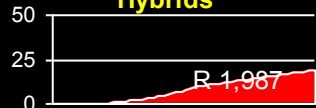
CCS 20 Mt



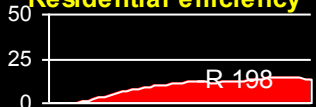
Biofuel subsidy



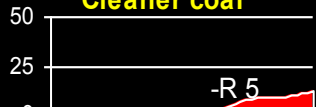
Hybrids



Residential efficiency



Cleaner coal



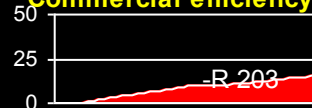
Fire control



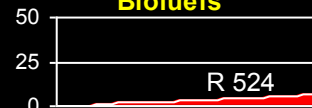
Electric vehicles in GWC grid



Commercial efficiency



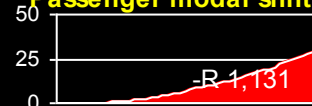
Biofuels



Waste management



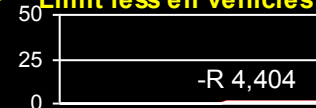
Passenger modal shift



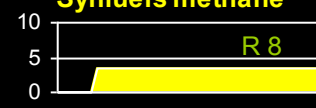
Synfuels CCS 23 Mt



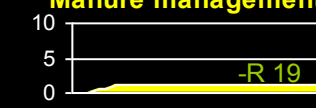
Limit less eff vehicles



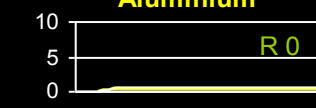
Synfuels methane



Manure management



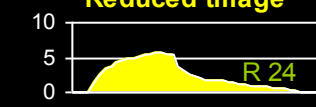
Aluminium



Enteric fermentation



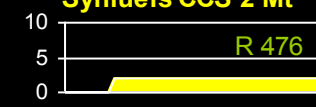
Reduced tillage



Afforestation



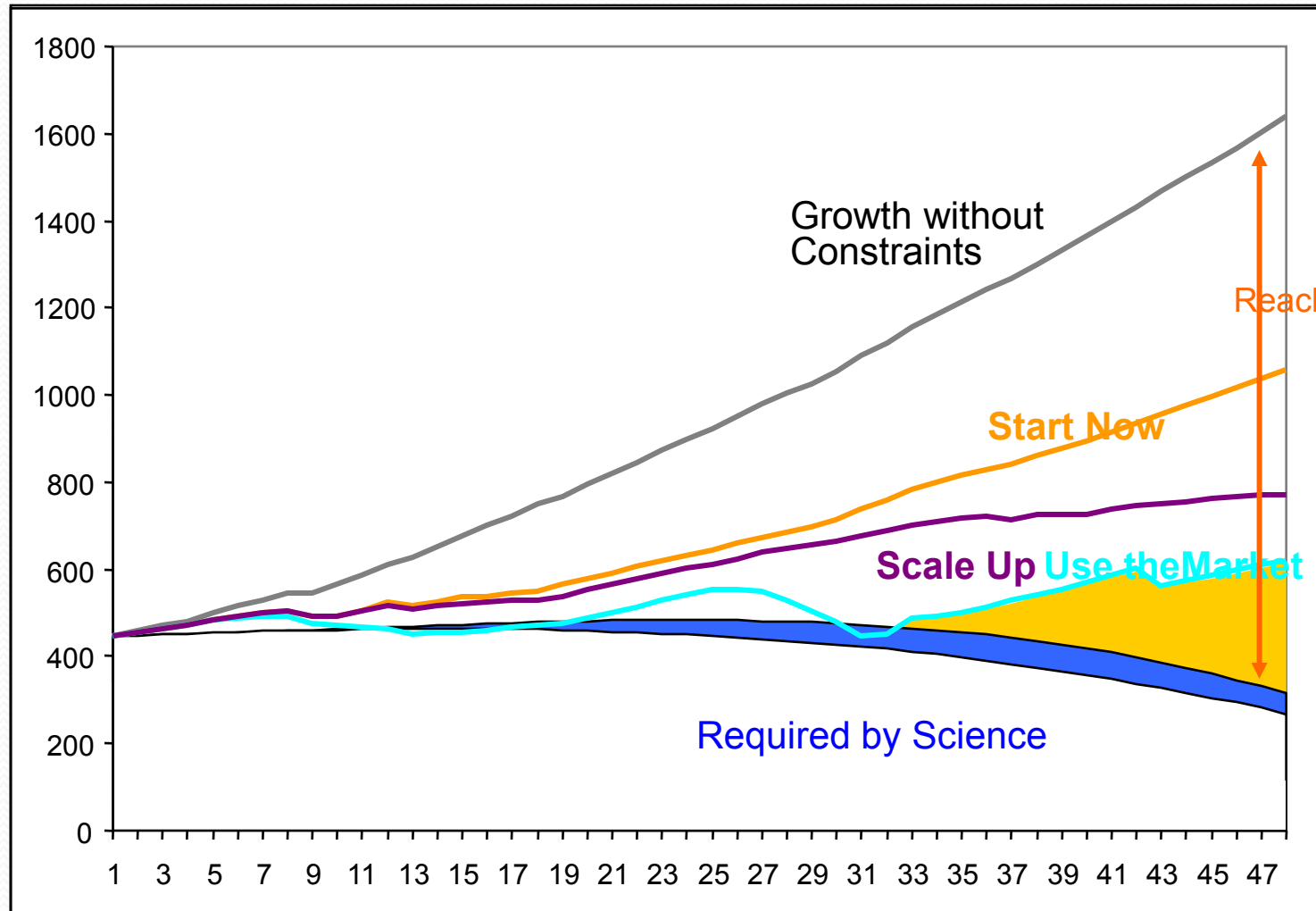
Synfuels CCS 2 Mt



Coal mine methane



# FOUR STRATEGIC OPTIONS

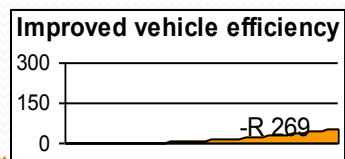
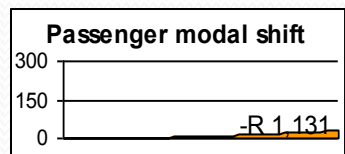
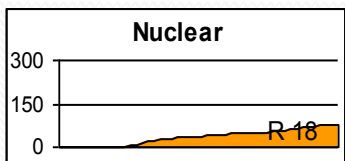
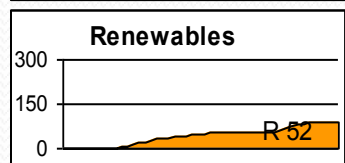
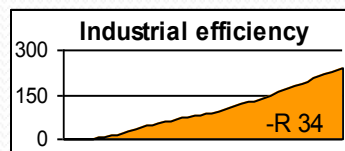


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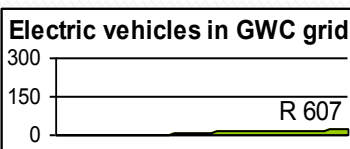
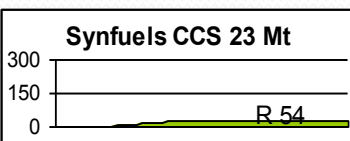
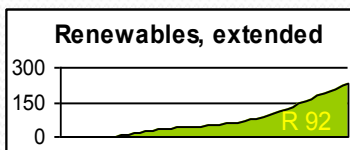
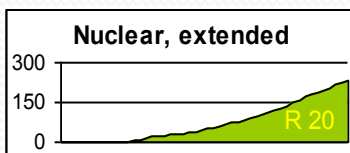
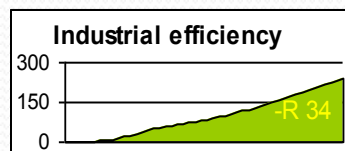
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# KEY STEPS BY STRATEGIC OPTION

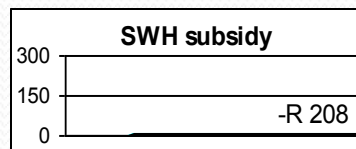
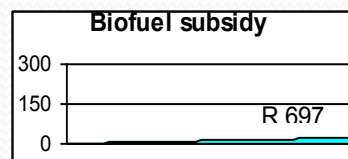
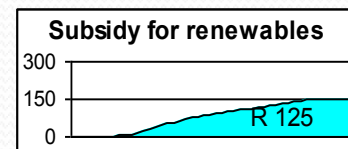
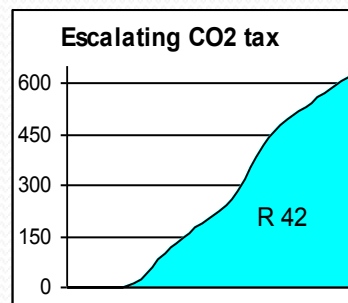
## Start Now



## Scale Up



## Use the Market



## Reach for the Goal

- New technology
- Identify resources
- People-oriented measures
- Transition to low carbon economy



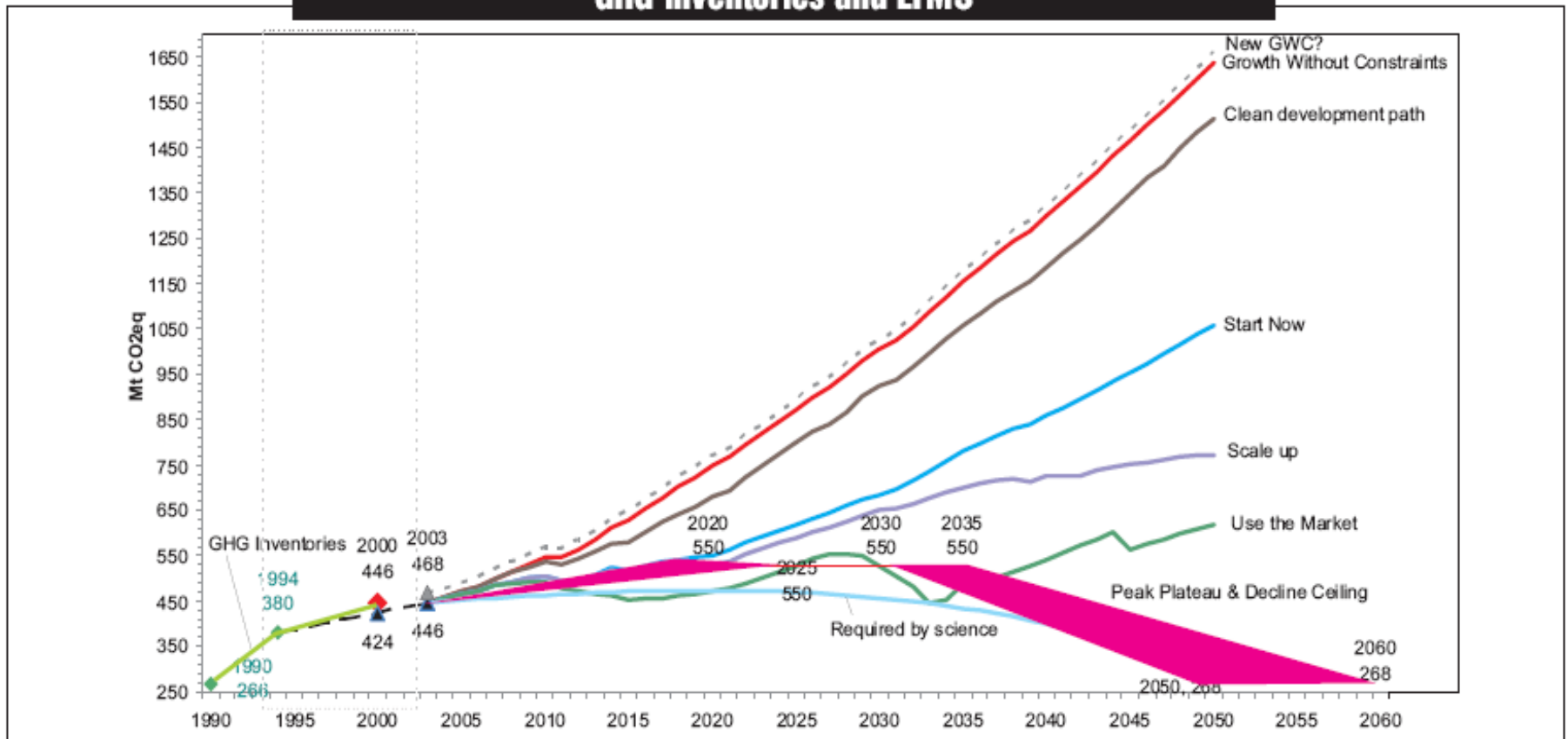
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# THE MITIGATION CHALLENGE – THE IMPLICATIONS OF GROWTH WITHOUT CONSTRAINTS

GHG inventories and LTMS



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# APPROACH TO GHG REDUCTIONS

- Peak, plateau and decline trajectory challenging but possible.
- Requires substantial international financing, technology and capacity building support to put in place interventions
- Supported by further policy measures – Refit tariffs, initiation of carbon pricing, project development.



# REDUCTION POTENTIAL OF LTMS SCENARIOS

*Emission reduction as %  
of the gap (GWC-RBS)*

*In the end  
year (2050)*

Start Now

43%

Scale Up

64%

Use the Market

76%



# ROLE OF CLEAN TECHNOLOGY FUND

- CTF support seen as critical step to support ambitious action
- Allows for technology demonstration projects to take place
- Provides capital and credit flows that enable early action
- Base from which transformative interventions can be built.





# CLEAN TECHNOLOGY FUND PORTFOLIO

- 2 phase proposal – projects ready for implementation in first phase – energy sector
- Second phase – focus on transportation sector and other energy sector activities
- CTF as enabler of action
- Indications of significant leveraging



# CTF PRIORITY AREAS

- Final design and risk mitigation review, followed by construction and operation of a 100 MW-capacity Concentrated Solar Power (CSP) plant – 1<sup>st</sup> ever commercial scale CSP plan in sub-Saharan Africa.
- Development of the first utility-scale wind power plant consisting of a 100 MW wind farm and support to pioneer private sector projects amounting to 100 MW new generation capacity.
- Support to municipalities and the private sector in a large-scale program to deploy solar water heaters (SWH), with a target of achieving 500000 households from electric to solar water heating over the next five years.
- Scale up energy efficiency investments by catalyzing the expansion of bank lending to the commercial and industrial sectors through lines of credit to commercial banks, contingent financing to foster energy service companies (ESCOs), and financial incentives or risk products to market leaders, such as large industrial customers.



# POTENTIAL FOR GHG REDUCTIONS

- CSP – 9 million tons over a projected 20-year plant life
- Wind plants - 5 million tons of CO<sub>2</sub> over a projected 20-year plant life
- SWH conversion program - Approximately 32 million tons of CO<sub>2</sub>, assuming a 20-year life.
- Energy efficiency sub- sector - More difficult to estimate the emissions savings however an initial estimate suggests annual emissions savings of about 9 million tons of CO<sub>2</sub>.



# DEMONSTRATION POTENTIAL

- Replication potential of CSP plants in southern Africa is vast
- South Africa alone - 40 GW of commercially viable CSP in the Northern and Western Cape provinces.
- Replication in Namibia and Botswana could double or treble this potential.
- Wind power – Potential for scale-up at an estimated 10,000 GW of economic wind potential.
- SWH - A 50 percent market penetration for the 7 million households with water heaters would treble the Government's one million SWH target, in line with the LTMS estimate of 307 million tons of CO2 reduction by SWHs over 40 years.
- Given South Africa's energy intensity, the scalability potential of energy efficiency interventions is substantial. Realization of the national target laid out in the National Energy Efficiency Strategy (i.e. 12 percent reduction in electricity consumption) would represent electricity savings of 110,000 GWh





# DEVELOPMENT IMPACT

- Many CSP components can be manufactured locally with positive benefits for domestic industrial development and employment and job creation. Also job creation during plant establishment and after.
- The SWH program has substantial benefits for the South Africa economy and specifically for low-income households as a result of lower electricity bills (in the context of rising tariffs), as well as increased jobs in a growing domestic SWH manufacturing and service industry, particularly in small and medium enterprises.
- Energy efficiency measures play an important role in limiting the need for new coal generation capacity, which would release money from the fiscus for spending elsewhere..
- All the interventions will have environmental co-benefits such as reduced NO<sub>x</sub>, SO<sub>x</sub> and particulates emissions from avoided coal-fired base load power plants and thus avoided health impacts, particularly for the poor.



# IMPLEMENTATION POTENTIAL

- The most significant enabling policy in place for renewable energy sources is the recently promulgated Renewable Energy Feed-in Tariffs (REFIT). It is supplemented by enabling efforts, including updating the wind atlas, outreach programs, and development of a grid code.
- The CTF financed SWH program will support implementation of a national strategy for SWH market development that is implemented through a GEF-supported project.
- For energy efficiency, a Standard Offer mechanism – under which any energy user or energy service company that can deliver energy or demand savings would be supported in relation to technology investment – is being rolled out. It provides a favorable basis for private sector-led energy efficiency project development.
- A generic risk for all investments is the low cost of electricity, However pending projected rate increases, (45% a year for the next 3 years) will have huge impact on the competitiveness of renewable interventions.



# ADDITIONAL COSTS AND RISK PREMIUMS

- The capital cost of the CSP plant is projected to be more than 3 times that of a supercritical coal-fired power plant. Adjusting for fuel and operations and maintenance costs, there still remains a viability gap of more than 1 Rand/kWh, in addition to substantial commercial and performance risks and cost uncertainties. However this does not factor in the sharply rising price of electricity over time, or the impacts of upscaling CSP
- Similarly, the production cost gap between a typical wind farm and a new supercritical coal-fired power plant is about 0.7 Rand/kWh. South Africa's feed-in tariff has attracted wind developers. However there is a need to address the additional costs and risks of first-movers: such as grid connection and transmission infrastructure, as well as the transaction costs of project development and financing.
- SWH will require bulk procurement to bring down costs and ensure quality of equipment, as well as financial incentives to address affordability issues faced by low-income consumers. In the energy efficiency subsector, CTF support would help provide easier access to financing and risk mitigation instruments to provide positive incentives alongside tariff increases.



# TABLE 1: RESULTS INDICATORS FOR THE CSP SUB-SECTOR

INDICATORS	BASELINE	INVESTMENT PROGRAMME RESULTS
Installed Grid Connected Solar Thermal Power Capacity in SA	0 (2009)	100 MW of new solar capacity
Estimated Annual GHG emission reductions	0 (2009)	0.45 MT Carbon equivalent/year
Rapid replication potential towards Govt goal of 4% of renewable energy power production by 2013	0 (2009)	100 MW new STP plants per year for four years yields 2.064 GWh annual production by 2013





## TABLE 2: RESULTS INDICATORS FOR THE WIND POWER SUB-SECTOR

INDICATORS	BASELINE	INVESTMENT PROGRAMME RESULTS
Installed wind power capacity in South Africa	20 MW (2009)	200 MW of new wind power capacity (100 MW public, 100 MW private)
Estimated annual GHG emissions reductions	0,04 Mt Carbon Equivalent	0.50 MT carbon equivalent per year
Rapid Replication potential towards Govt goal of 4% renewable energy power production (eg 10 000 GWh) by 2013	44 GWh (2009 est)	10 new 100 MW wind farms would produce 2,700 GWh annual output



# TABLE 3: RESULTS INDICATORS FOR SWH SUB-SECTOR

INDICATORS	BASELINE	INVESTMENT PROGRAMME RESULTS
Installed Commercial and Household SWHs	25 000 SWH installations	500 000 SWH installations
Estimated Annual GHG emission reductions	0.081 MT carbon equivalent	1.62 Mt Carbon equivalent per year
Rapid Replication Potential toward Govt goal of 4% renewable energy power production (eg 10 000 GWh) by 2013	90 GWh	1 million SWH installation would reduce electricity production needs by 3600 GWH



# TABLE 4: ENERGY EFFICIENCY RESULTS INDICATORS

INDICATORS	BASELINE	INVESTMENT PROGRAMME RESULTS
Installed Industrial , Commercial and Household EE	1 000 GWh (2008 Eskom actual results)	10 000 GWh
Estimated Annual GHG Emission Reductions	0.9 Mt carbon equivalent (2008 Eskom actual results)	9.0 Mt Carbon equivalent per year
Rapid replication potential towards Govt goal of 12% reudction in 2015 projected consumption	1 000 GWh	10 000 GWh yields 10% of the 110 000 GWh required to meet the 2015 goal



# TABLE 5: INDICATIVE FINANCING PLAN (IN US\$ MILLIONS)

PROJECT	CTF				AD B	IBR D	IFC	EIB	KF W	AFD	TOTAL
	IBRD	AD B	IF C	ADB (private sector)							
Eskom CSP	200	50		-	50	150		50	100	-	600
Eskom Wind	50	50		-	50	110		-	-	140	400
Private Sector Renewable energy/ energy efficiency/ SWH	-	-	75	75	-	-	200	50	-	210	610
<b>Total</b>	<b>250</b>	<b>100</b>	<b>75</b>	<b>75</b>	<b>100</b>	<b>260</b>	<b>200</b>	<b>100</b>	<b>100</b>	<b>350</b>	<b>1,610</b>



# GREENPEACE SETS SIGHTS ON SOUTH AFRICA

(Article in the Mail and Guardian– Donna Bryson, Johannesburg, South Africa - Oct 13 2009)

Extract of quotes:

- “South Africa can cut its annual greenhouse gas emissions by more than 200-million tonnes by 2050 without sacrificing economic growth if it uses energy more efficiently and increases wind and solar power production, Greenpeace said on Monday.” - *The CTF Investment Plan envisages reducing emission by 46 million tons over 20 year projected plant life and energy efficiency gains of emission reductions of 9 million tones of CO2 annually*
- “South Africa could find economic opportunity, becoming the continent's hub for green technologies now more commonly found in North America, Asia and Europe, said Brad Smith, co-author of a new report on South Africa by Greenpeace and the European Renewable Energy Council, a Brussels-based campaign group.”
- "Hopefully, South Africa will develop a homegrown industry and export the technology," said Smith, campaign director for Greenpeace's new Johannesburg-based Africa office. *CTF Investment plan - Replication potential of CSP plants in southern Africa is vast; “Since most of the component value of CSP and wind power plants can be sourced locally, the economic and social benefits of these renewable technologies would include domestic industrial development and employment.”; “increased jobs in a growing domestic SWH manufacturing service industry, particularly in small and medium enterprises.”*
- Greenpeace researchers acknowledged that many South Africans don't have heating systems in their homes, and that the country "sits with the legacy of apartheid where people were denied access to basic infrastructure and services". *CTF Investment plan - CTF support would accelerate SWH market penetration and development of a domestic SWH industry by buying down high installed cost, market development, and demonstrating business models. (500000 SWH installations)*



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# SOUTH AFRICA DREAMS.....



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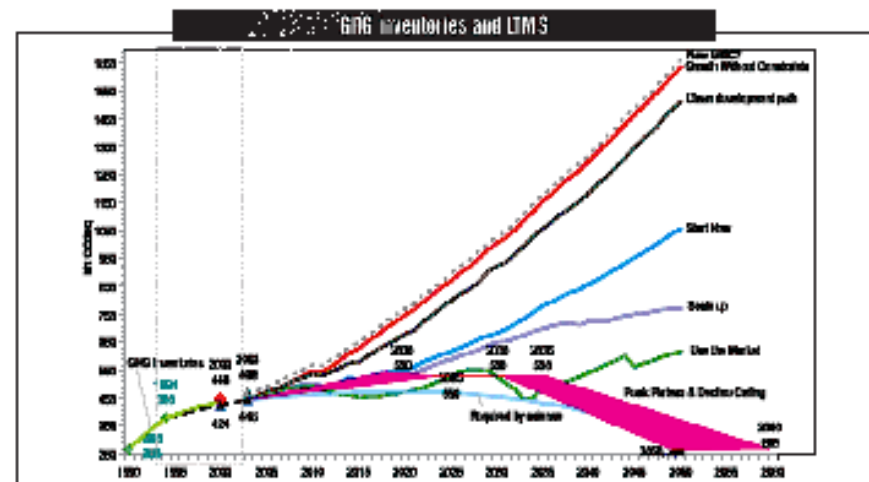


The Sowetan, 29 June 2008

## Climate Change - Government says “Peak, Plateau and Decline”

Government has made its position clear – South Africa’s greenhouse gas emissions must stop growing in 2020-25 and must begin to decline in absolute terms in 2030-35.

In a statement, welcomed by many climate change and energy stakeholders, the Minister presented Government’s policy directions for South Africa’s climate change response policy at a press briefing in



a courageous target that provides a real and unambiguous signal to the market” said the



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Engineering News, 15 June 2010

# Northern Cape Solar Power Station Takes Shape

Energy reporter

"We are on track to get base-load solar power into the grid by mid-2012" says the Project Manager for South Africa's flagship solar power station.

Following the groundbreaking ceremony earlier last year, work on building the 100MW concentrating solar power station has been humming along and the plant is taking shape.

"This is an exemplary project" according to the main international donor  
ing now calling itself the Solar Capital of



Upington a-buzz. "We haven't seen this much economic activity in years" says



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Cape Times, Monday 12 June 2015

# Employment at record levels in Northern Cape

Staff reporter

The mining down-turn in the 1980s led to massive unemployment in the Northern Cape Province with unemployment figures rising to over 30% in many areas. The lack of water and economic opportunities in the area did not help matters.

But turning the desert into Africa's biggest solar power station has dramatically changed the situation. Where there was hopelessness, there is now a new entrepreneurial spirit as employment reaches 93% and local businesses boom



as a result of blooming down-stream industries. With Upington now calling itself the Solar Capital of the World, new factories and service industries are



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## “Green Energy” tag boosts exports

South Africa's global dominance in the renewable sector is now positively impacting exports of non-energy products.

According to a survey published yesterday, products manufactured in South Africa that bear the “Green Energy” tag are in high demand as consumers become far more picky about what energy source

to be expected” noted an aging Harald Winkler.

How times have changed - The Lethabo coal-fired power station monument, now matches the Voortrekker Monument as a tourism attraction that documents our recent past. “I can't believe that we used to burn fossil-fuels like there was no tomorrow” says 12 year old Turni as she carefully



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# The “African Century” is being driven by clean energy

With South Africa being the largest supplier of solar energy technology in the world, the South Africa-Namibia-Botswana Trans-Frontier Solar Park being the largest concentrating solar facility in the world and North Africa providing 60% of Europe's electricity from its solar stations, Africa's global economic ascendancy owes much to its

we forgot what our natural resources really are” responded the President and added “our re-awakening to our real natural wealth has paved the way.”

“Beneficiation is the key – we were simply processing the wrong stuff and destroying our natural heritage in the process” said the spokesperson for the African Union Energy Centre. In hindsight, one has to wonder

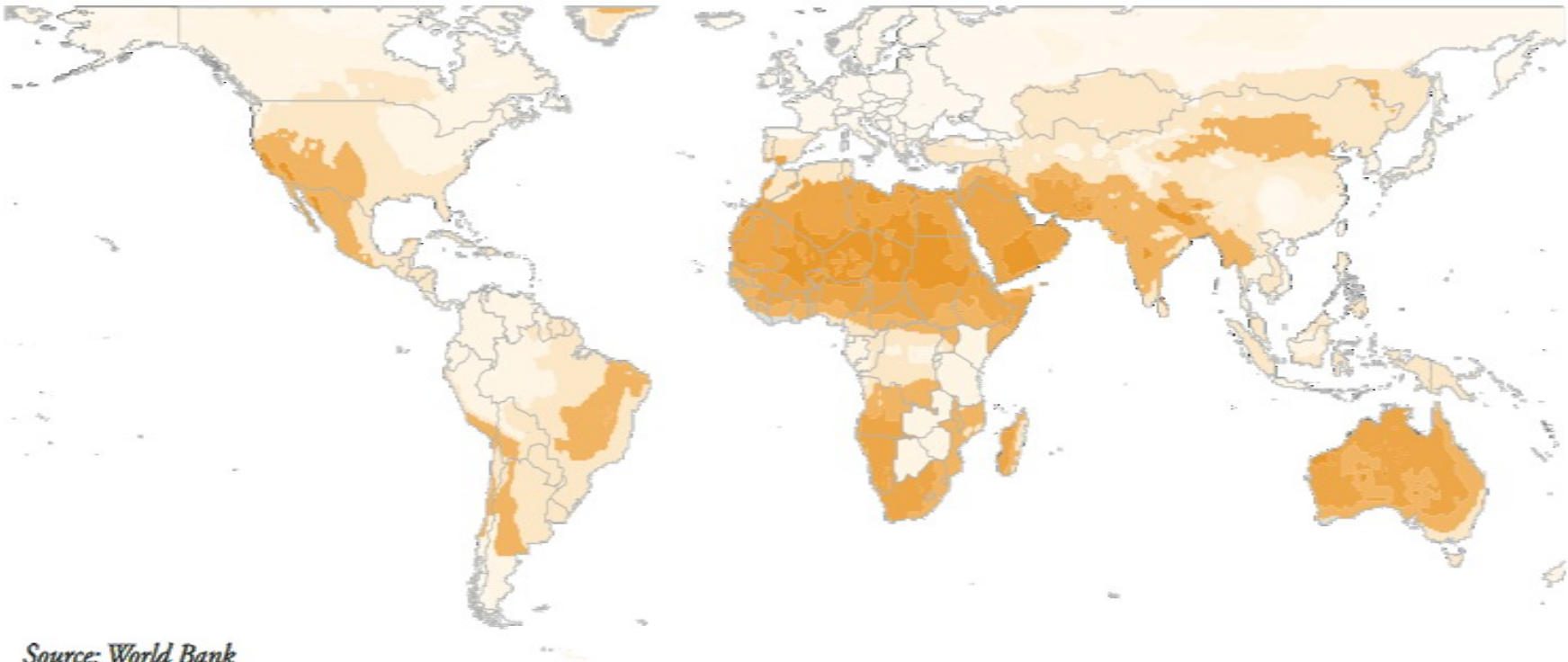
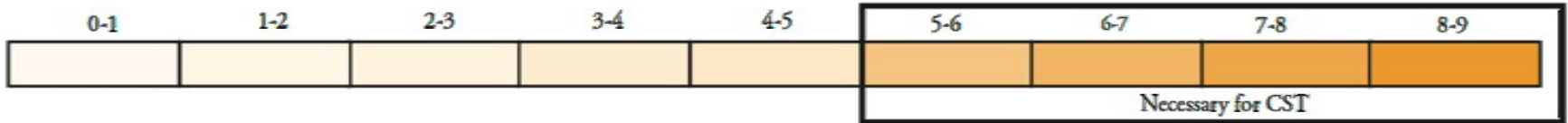
clean energy has unlocked Africa's potential. Things really started moving when we realised the simple fact that we could not be world leaders by being followers” noted Eskom's CEO.

Denel, South Africa's leading renewable energy technology company, has agreed to pay back all its governmental “bail-out” support from the 1990s as



# THE GLOBAL SOLAR RESOURCE

Global Direct Normal Solar Radiation ( $\text{kW/m}^2/\text{day}$ )

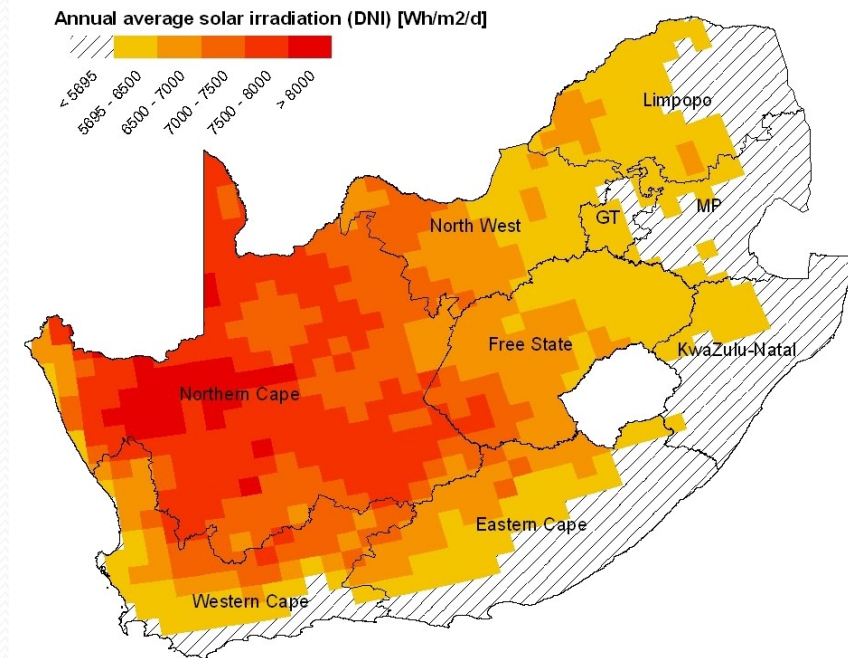


Source: World Bank



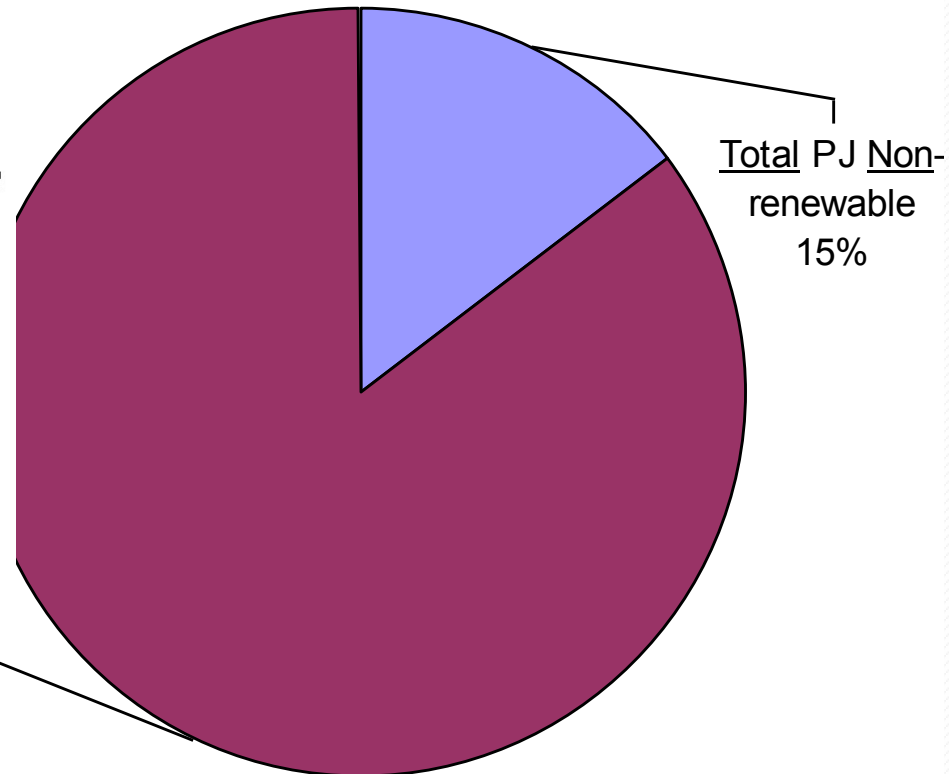
# SOUTH AFRICA'S ENERGY

## RESERVES



## Energy Reserves

Annual PJ  
renewable  
85%



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The figures quoted from South Africa's 1st National Communication under the United Nations Framework Convention on Climate Change (2004), refer to: De Villiers, M.G., Howells, M.I. and Kenny, A.R. 2000. *Sustainable Energy for South Africa: Energy Scenarios from 1995 to 2025*. Energy Research Institute, University of Cape Town.

Forward to a  
sustainable  
energy future



THANK YOU  
FOR YOUR KIND  
ATTENTION



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