Jobs, investment and competitiveness in Alternative Energy Generation

TIPS
TRADE & INDUSTRIAL POLICY STRATEGIES

Peet du Plooy

Contents

- **Drivers** for Alternative Energy Generation (AEG)
- **Investment** in AEG - reality and prospects in SA and world-wide.
- **Jobs** in AEG
- **Competitiveness** in AEG
- Where are the **biggest, fastest and cheapest opportunities** for investment, jobs and competitiveness.
- **Supporting** AEG - Will it cost government money?
- **Regulatory** and **institutional** barriers/gaps.

Drivers

Energy security

> Cost stability, managed risk through diversity

Climate change

> Carbon competitiveness, turning a need into opportunity

Industrial development

> Manufacturing, services

Job creation and livelihoods

> Secure and new jobs and nature-based livelihoods

Green economy links 3 capitals

Natural capital gain (prevent degradation/ polution and restore)	**Economic** capital gain (savings, investment, competitiveness)	**Social** capital gain (jobs, livelihoods, health)
Sustainable **energy** (efficient and renewable)	Industrial development, Rural dev. (energization), Carbon competitiveness, Energy security	Decent, blue and white collar jobs
Fresh **water** (manage pollution and waste, restore catchments)	Water security	Rural job opportunities, health
Healthy **soil**	Food security, Savings on agri-inputs	Job-intensive agriculture
Efficient **materials** (waste management, recycling)	Resource savings	Job-intensive rather than energy-intensive materials
Functional **ecosystems** (conservation, corridors)	Tourism	Heritage

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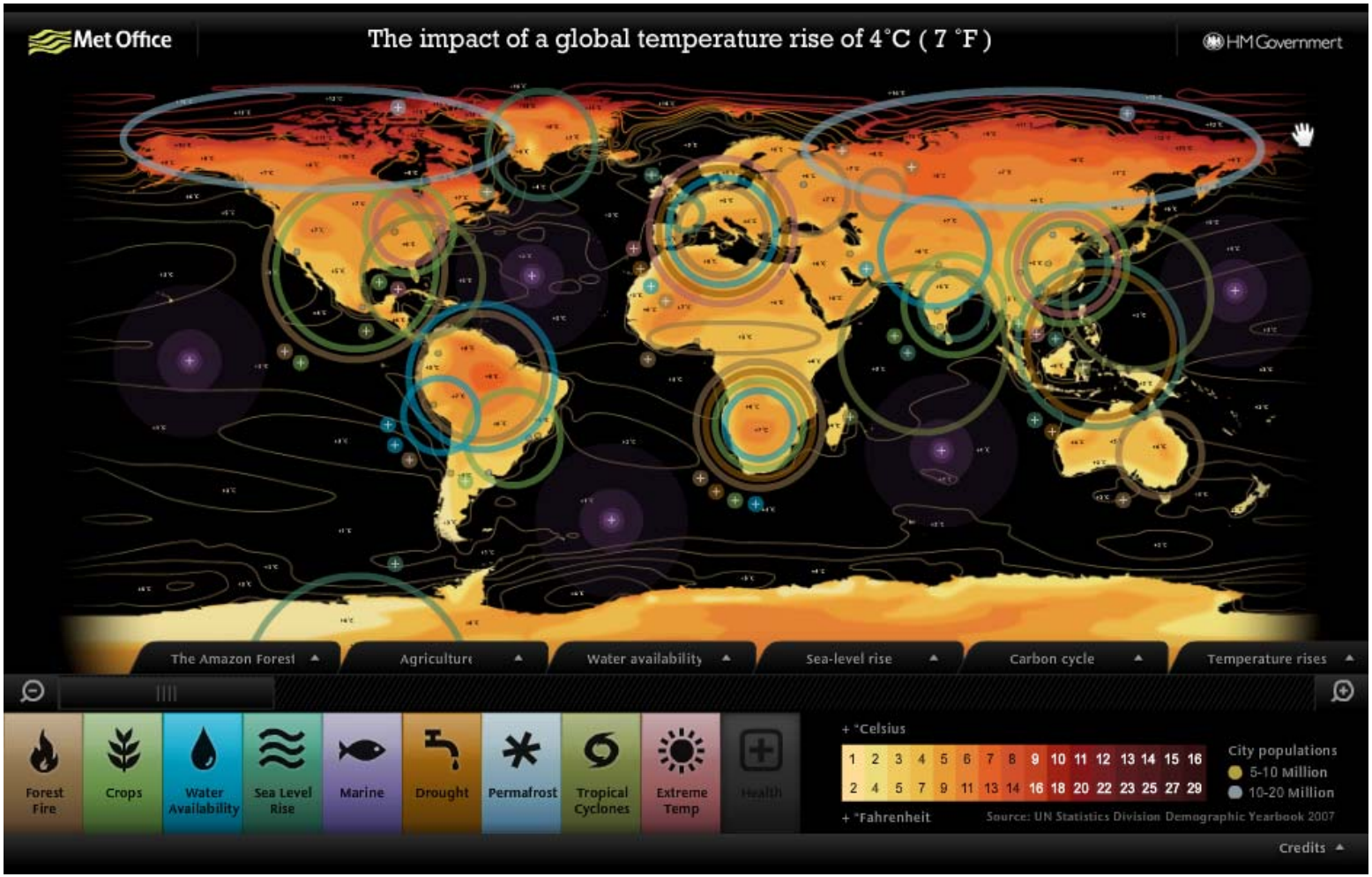
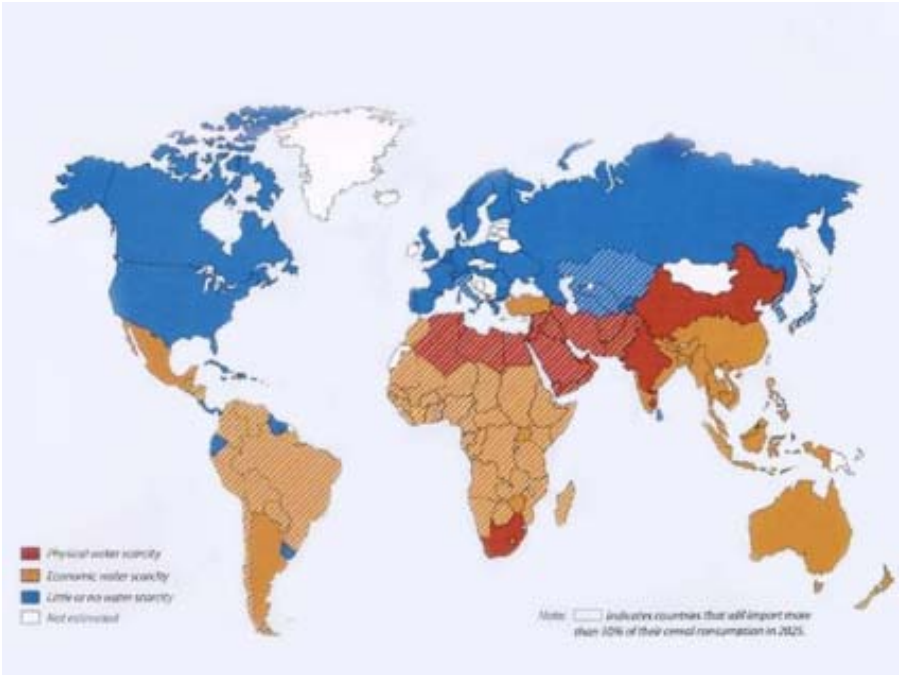
Climate risk

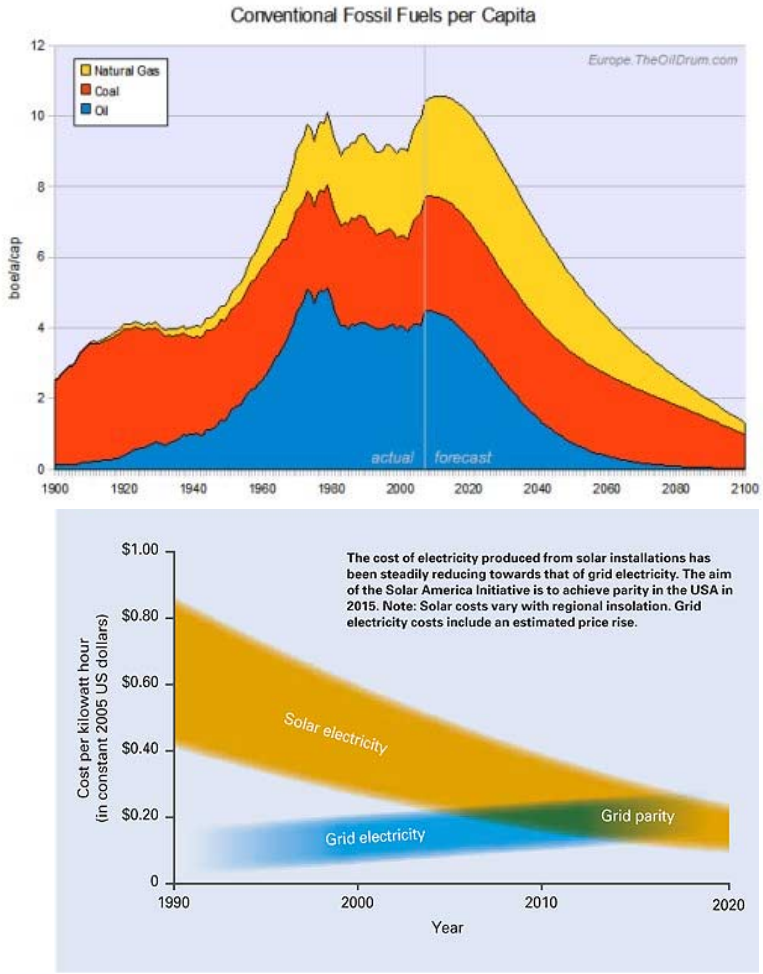


Energy futures

Energy futures

not if, but when





(Graph sources: Water Research Inst., Oil Drum, BP)

…and who profits (most)

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World trends and SA

SA share of world total :

- CO2: 1.6%
- Electricity: 1.4%
- GHG: 1.16%
- Energy Use: 1.14%
- Land Area: 0.82%
- Population: 0.73%
- Economy: 0.71%

(Source: cait.wri.org +)

>> **The 1% rule** for “SA’s fair share”

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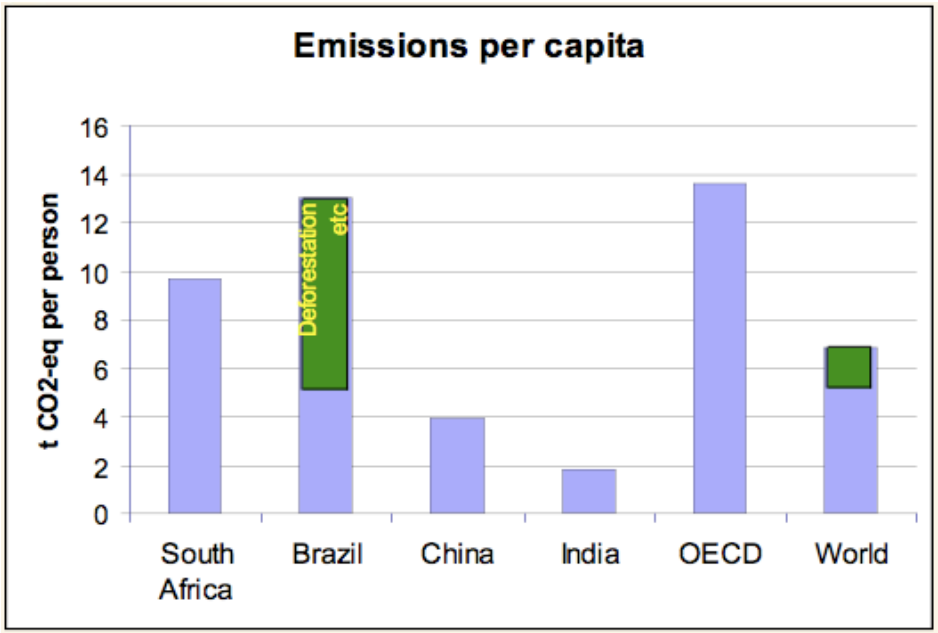
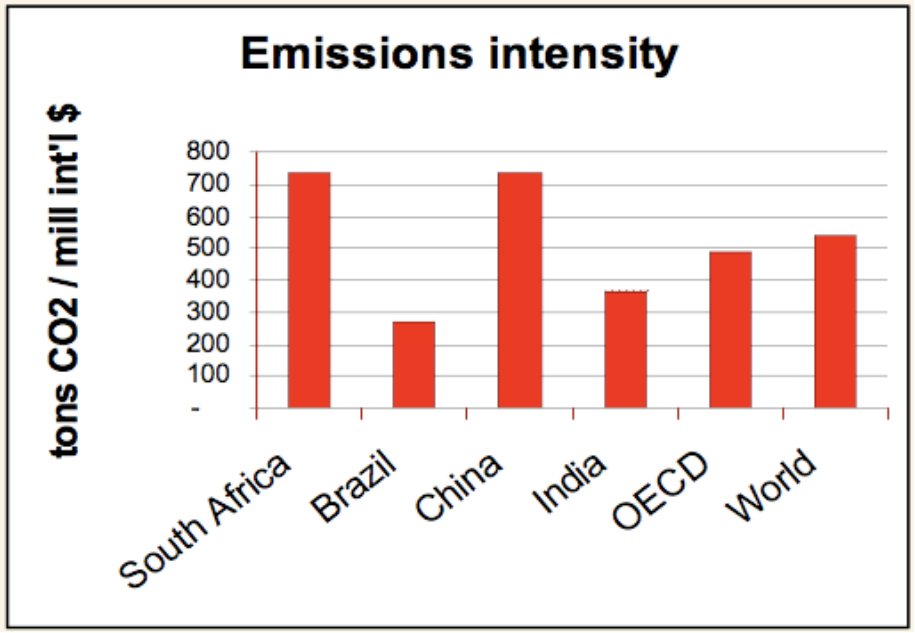
World trends and SA





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Green economy - investment

Global ("Traditional") EGS *(UK Treasury, 2004)*:

- 2004: $548bn
- 2010: $688bn (projection)
- 2015: just under $800bn (projection)

Global EGS *(ILO, 2008)*:

- 2008: $1 370bn
- 2020: $2 740bn (projection)

SA EGS *(Nedlac, 2006)*:

- R14.5bn-R23.2bn ($3-4bn) in '04
- between 1% and 1.6% of GDP
- between 0.44% and 0.7% of world
- **80% in waste management**

SA's 1% "fair share" *(UK)* = $5.5bn in 2004, *(ILO)* = $13.7bn in 2008

>> catching up would see EGS at least triple

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The low-carbon EGS sector

Global Low-Carbon EGS in 2008: £3 046bn =

$5 trillion

(UK Department of Business Enterprise and Regulatory Reform)

- Traditional EGS 21.6%
  (waste management, pollution control, recycling)
- Renewable Energy 30.9%
  (including hydropower)
- Emerging Low Carbon 47.5%
  (including alternative fuel, alternative fuel vehicles and building technologies)

SA 1% “fair share” = $50bn = R375bn = 7% of GDP

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The low-carbon EGS sector

Asia	38%
Americas	30%
Europe	27%
Rest of the World	**5%**

Country	**Market £bn**	**% of global**
United States	629	20.6
China	**411**	**13.5**
Japan	191	6.3
India	**191**	**6.3**
Germany	128	4.2
United Kingdom	107	3.5
France	93	3.0
SA	**3?**	**0.1?**

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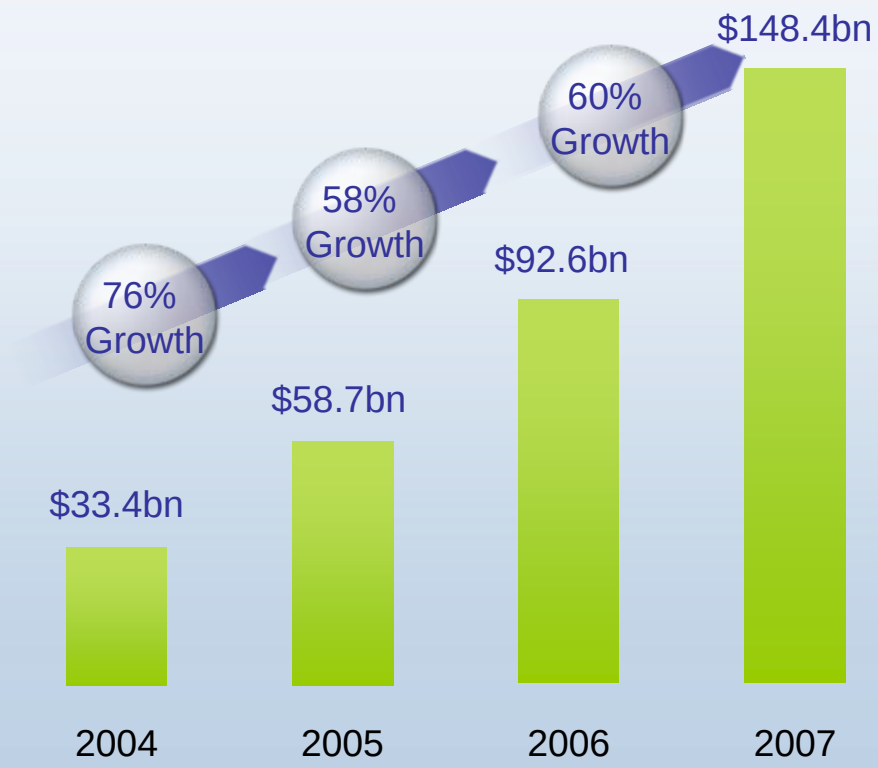
Renewable energy investment



- **1%** of global fixed asset investment
- **19%** of global energy industry infrastructure investment
- Expected to reach **$450bn** in 2012 (UNEP)

Adjusted for reinvestment. Geared re-investment assumes a 1 year lag between VC/PE/Public Markets funds raised and re-investment in projects.

Source: New Energy Finance, IMF WEO Database, IEA WEO 2007, Boeing 2006 Annual Report

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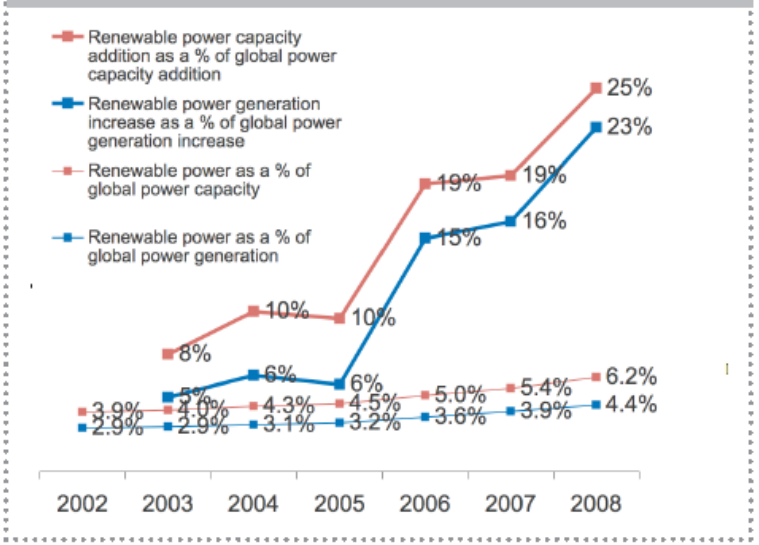
Renewable energy resilience

In 2008, a crisis year…

- RE investment ($140bn) exceeded coal investment ($110bn)
- RE (capacity) grew 16% even as world oil use declined.
- Biodiesel production increased 34%, but…
- Solar power grew strongest at 73% (down from growth of more than 200% y-o-y for ’04-’07)

Figure 3: Renewable power* generation and capacity as a proportion of global power, 2003-2008, %



* Excluding large hydro

Source: EIA, IEA, New Energy Finance, Global Futures, UNEP SEFI

- 2009 growth is slower, but faster recovery than in almost any other sector, supported by fiscal stimulus
- 2009: no coal stations in the US, while China doubles wind target, again

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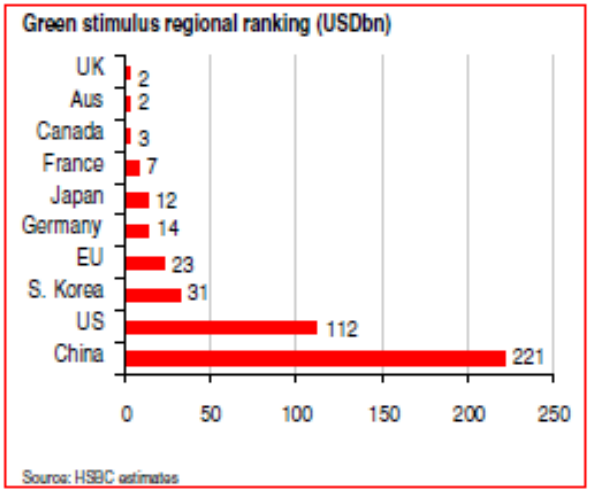
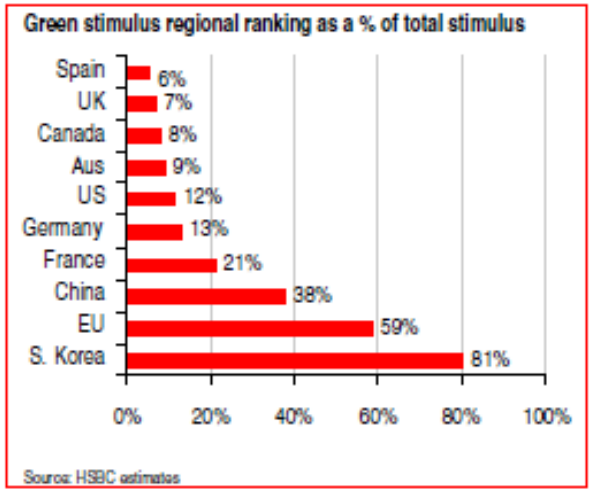
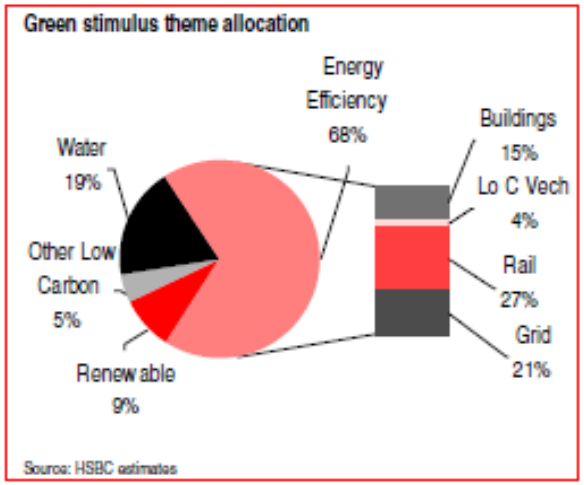
Green stimulus







Global Green Stimulus: $430bn over 3yr peaking at $220bn in 2010
(Source: HSBC)

SA's 1% "fair share" (Green Stimulus) = $4.3bn
A 1% of GDP "Green New Deal" commitment = $2.5bn

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The clean energy sector

Already larger than pharma (at EUR630 bn, EUR540 in energy efficiency),

Expected to be world's 3rd largest industrial sector by 2020, at EUR1.6 trillion (WWF)

Cost (global low-carbon reindustrialization)
= $45 trillion over 25 years >> market opportunity

Desertec: €400bn North-African solar mega-grid
(world's largest ever project)

Cleantech:

- Fastest-growing among venture capital sectors
- 16x growth '00-'08

Renewable energy jobs globally

Renewable energy jobs today: 2.3m

- Wind: 300 000
- PV: 170 000
- Solar Thermal: 600 000
- Biofuel: 1 000 000

ILO forecast for 2030:

- Wind: 2 100 000
- Solar power: 6 300 000

US case:
Coal mining + transport + power stations = **174 000** jobs

Wind industry = **83 000** jobs today, **110 000** jobs in **solar** by 2012

Coal in SA:
< 50 000 jobs (mining + Eskom GX), of which **17 000 at risk** from strict global climate curbs (ILO)

SA's 1% "fair share" in:

RE today = 23 000 jobs
RE 2030 *(ILO)* = 21 000 wind + 63 000 solar jobs +…

RE 2013 *(DME target)* = 20 000 jobs

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Renewable energy jobs globally

Country	RE jobs	SA's % of country's GDP	GDP-equivalent jobs	SA's % of country's population	Population-equivalent jobs
China	943 200	6%	57 000	3.7%	37 000
Germany	259 100	7.5%	19 000	60%	155 000
Spain	89 001	17%	15 000	106%	94 000
US (direct only)	193 550	2%	4 000	16%	31 000
US (incl. indirect)	446 320	2%	9 000	16%	71 000

Renewable energy job intensity

Table II.1-7. Estimated Employment per Megawatt, Renewable and Fossil Fuel Power Plants

	Average Employment over Life of Facility (Jobs per megawatt of average capacity)		
	Manufacturing, Construction, Installation	Operations & Maintenance/ Fuel Processing	Total
Solar PV	5.76–6.21	1.20–4.80	6.96–11.01
Wind power	0.43–2.51	0.27	0.70–2.78
Biomass	0.40	0.38–2.44	0.78–2.84
Coal-fired	0.27	0.74	1.01
Natural gas-fired	0.25	0.70	0.95

Note: Based on findings from a range of studies published in 2001–04. Assumed capacity factor is 21 percent for solar PV, 35 percent for wind, 80 percent for coal, and 85 percent for biomass and natural gas.

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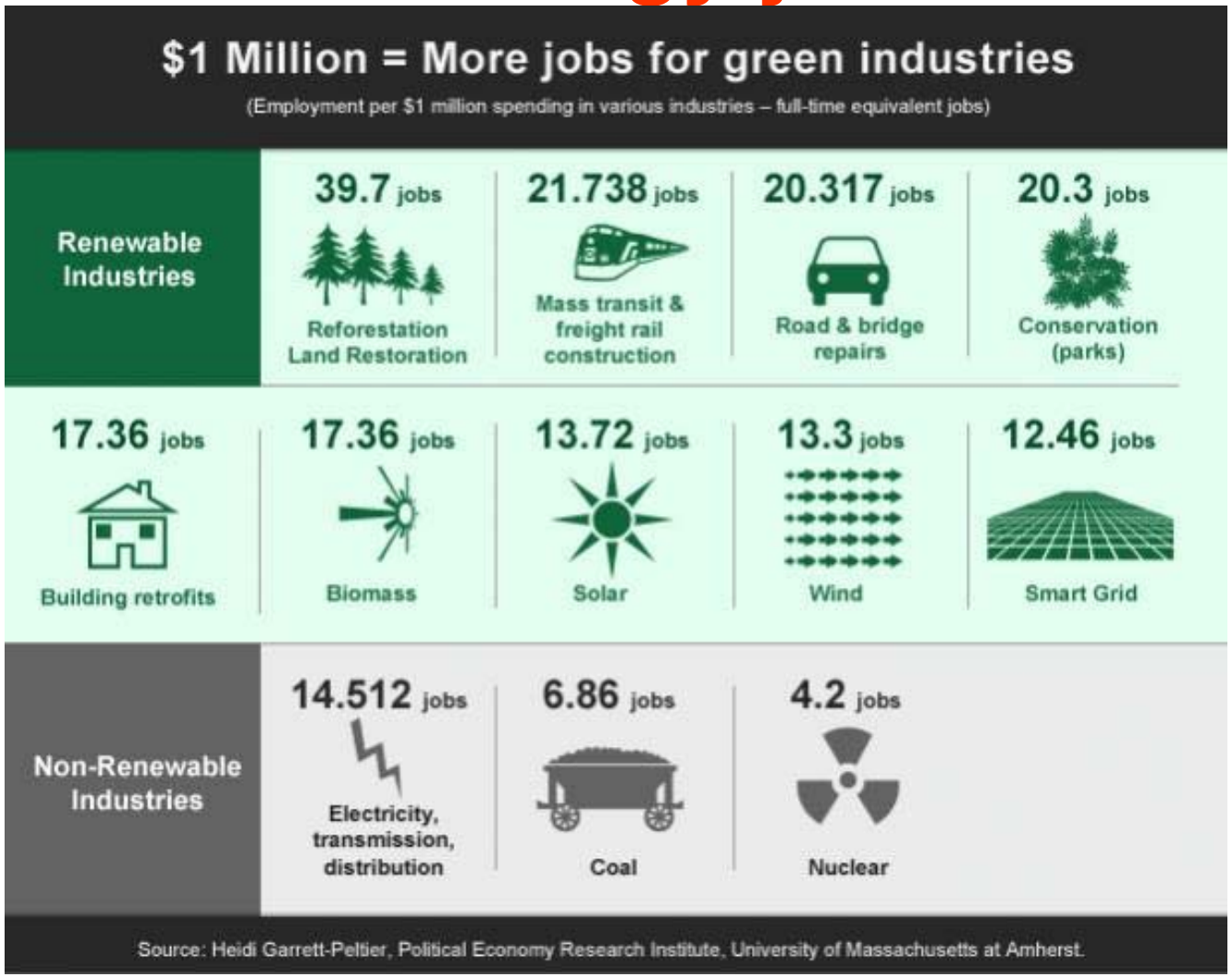
Renewable energy job intensity



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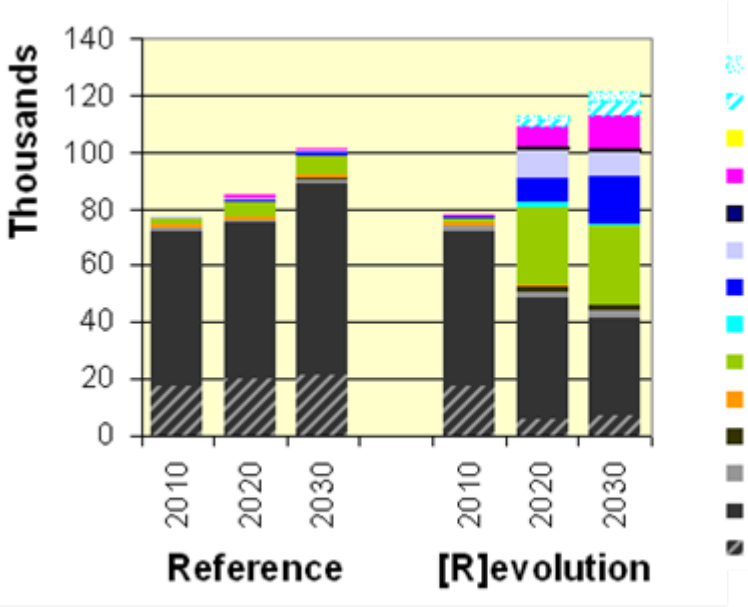
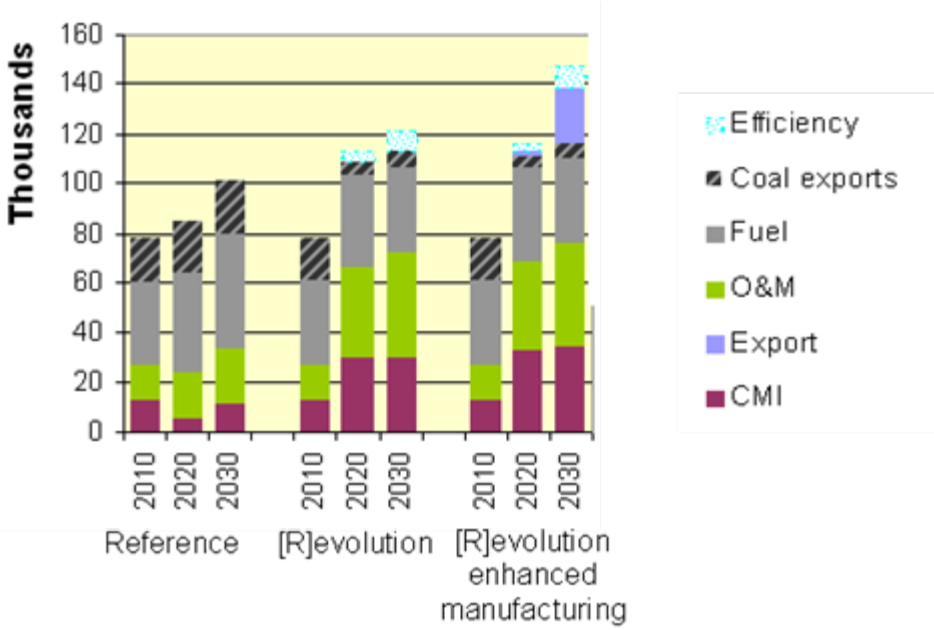
Renewable energy jobs in SA





Greenpeace [R]evolution scenario, by 2030:
> Additional 26,300 jobs (nett) in the energy sector
> Additional 22,000 jobs in renewable export
> 147,400 in total, 45% more than in the Reference scenario

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High-jobs potential projects

Renewable Energy – Working for Energy

- *Biogas*:

  310,000 rural households in SA have the technical capacity to generate energy from cow dung and human waste in biogas digesters. They can:
  - ❑ be energy independent.
  - ❑ save R325m per year in energy cost, or
  - ❑ generate R1,2 billion in value as LPG replacement.
  - ❑ generating **45 000 person years in job opportunities**

- *Solar waterheating:*

  - ❑ ~3m electrical heaters installed since 1997. Solar panels could have saved 2 000MW (averting energy crisis of 2008?). Cost of replacing electric geysers = R30-billion.
  - ❑ **12 000 jobs** in 2015? (~4% of Chinese jobs today)

Clean energy jobs

Contribution to GDP

“Big Five”

• finance, real estate and business services	20.68%
• manufacturing	18.24%
• wholesale, retail, catering and accommodation	15.09%
• general government services	14.61%
• transport, storage and communication	10.25%

“Small Five”

• mining and quarrying	6.71%
• personal services	5.92%
• construction	3.23%
• agriculture, forestry and fishing	2.79%
• electricity, gas & water	2.47%

Source: DoA

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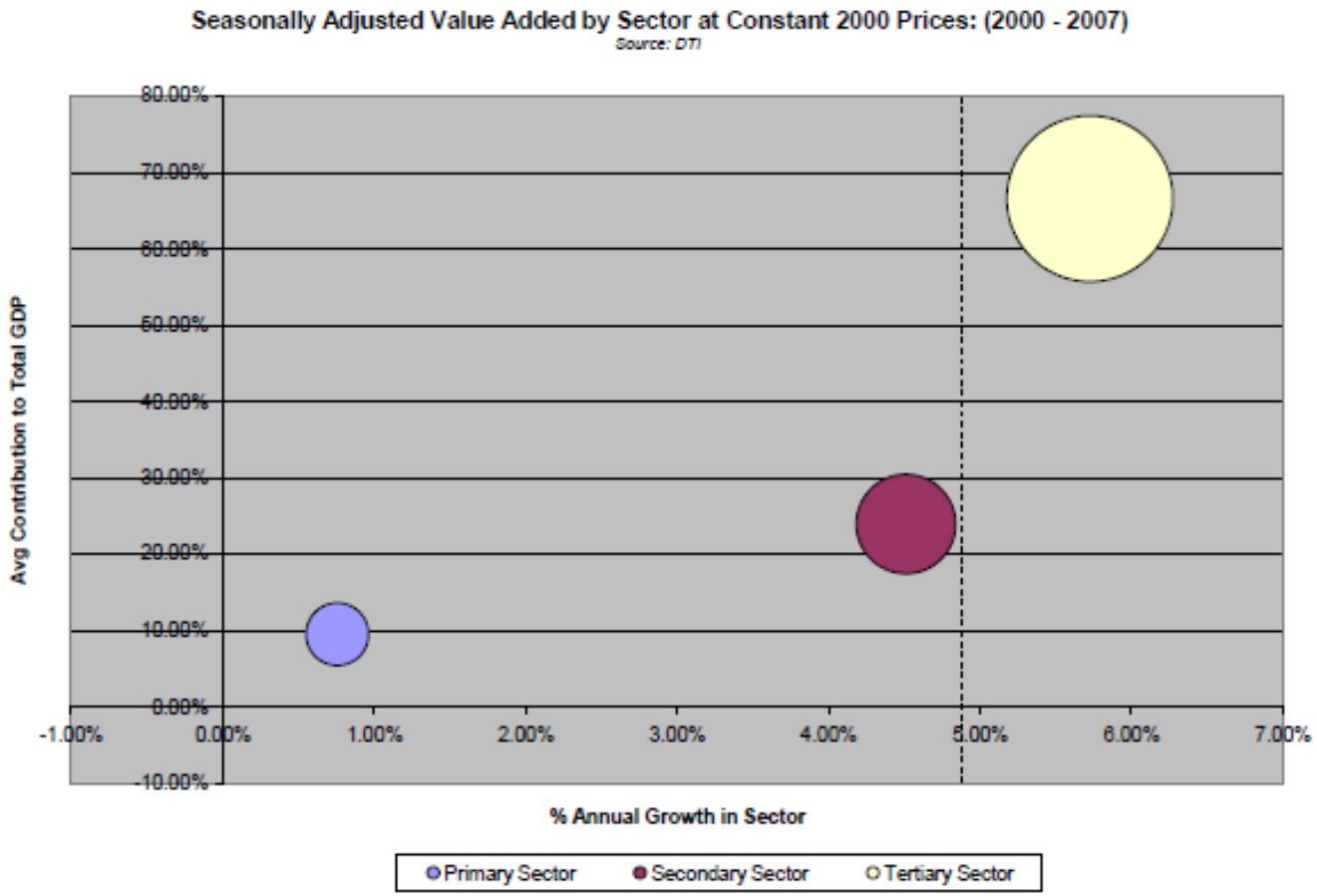
Jobs in a greener economy



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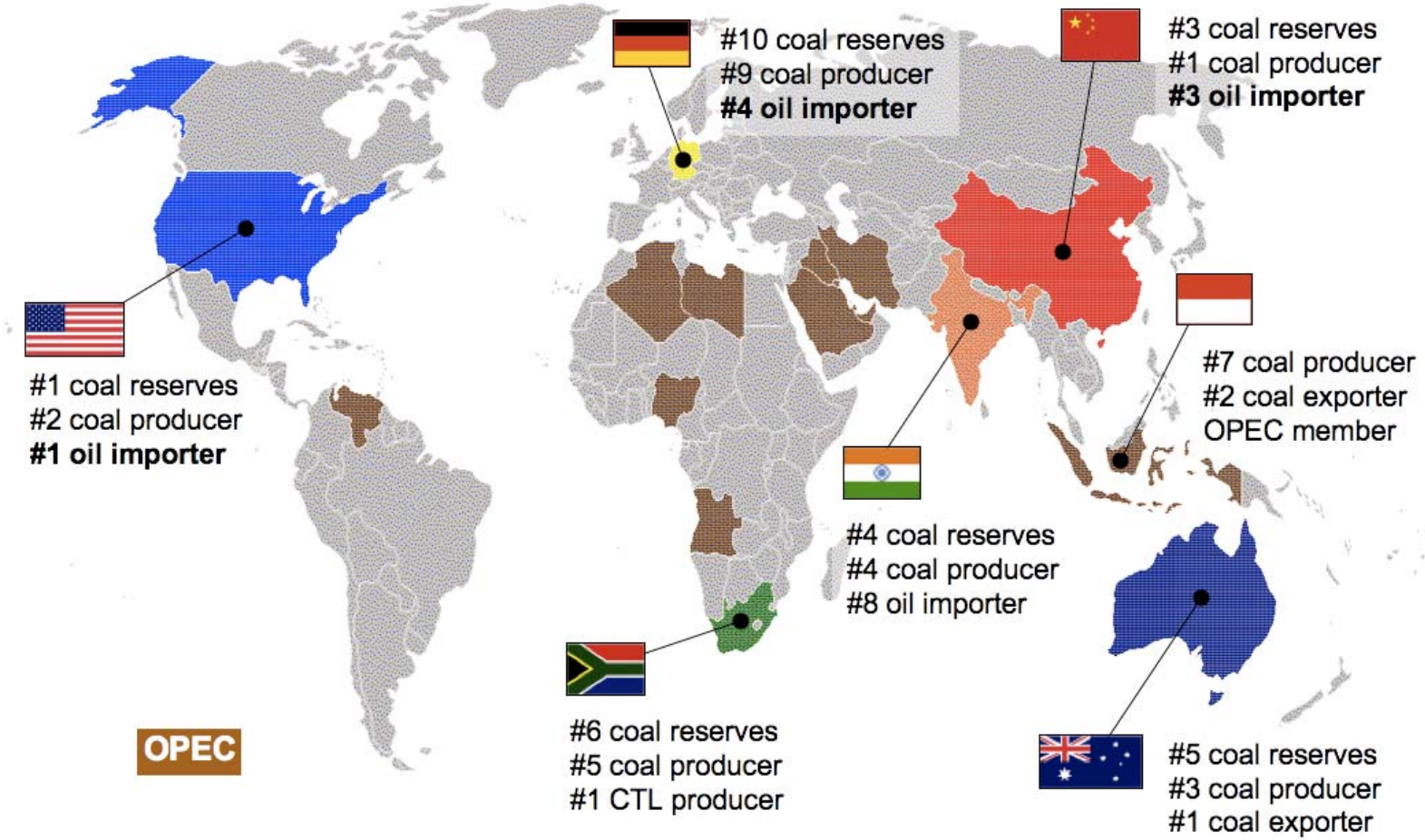
Competitiveness - resource



CTL = 2x Lifecycle GHG emissions, no clarity on CCS

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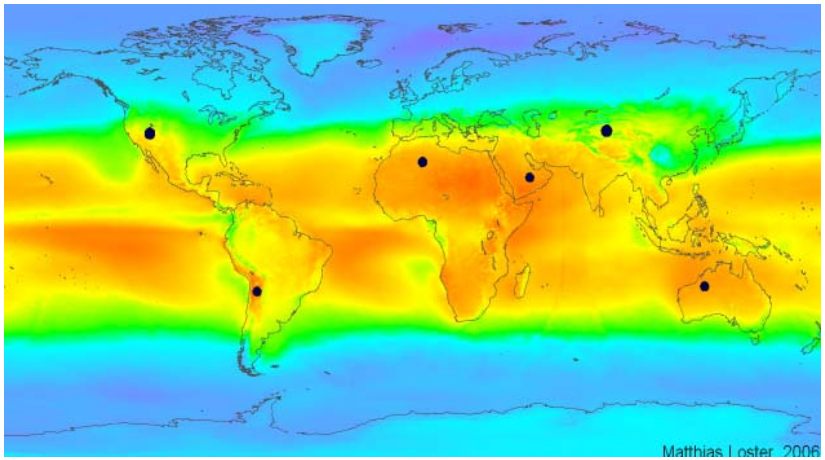
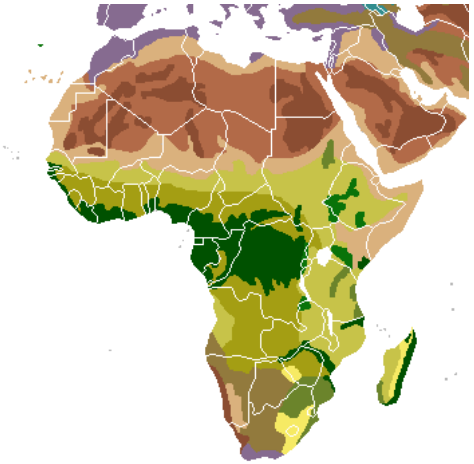
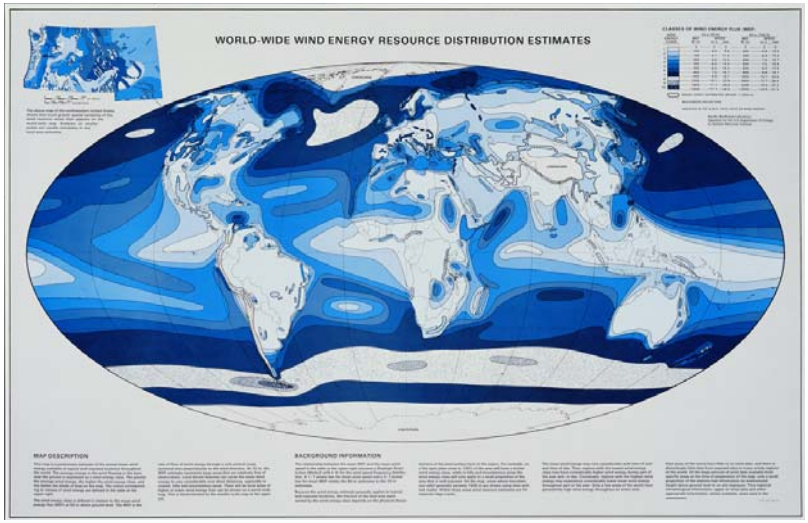
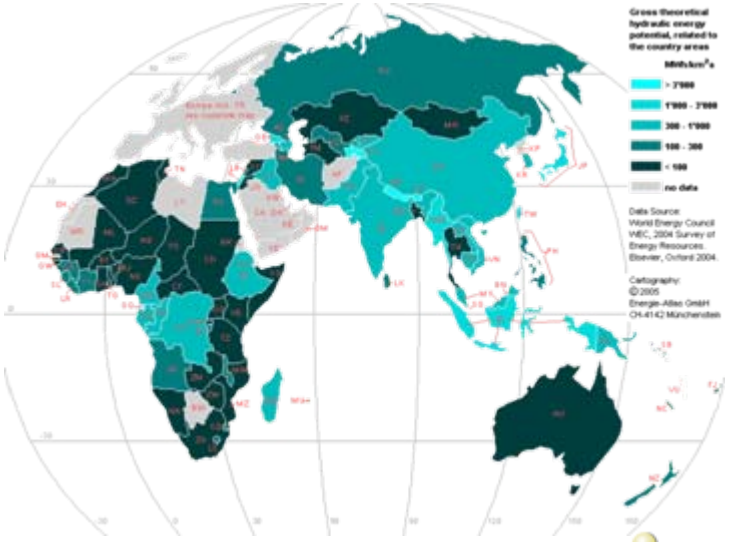
Competitiveness - resource









(Clockwise from top left): Sun, biomass, hydro, wind

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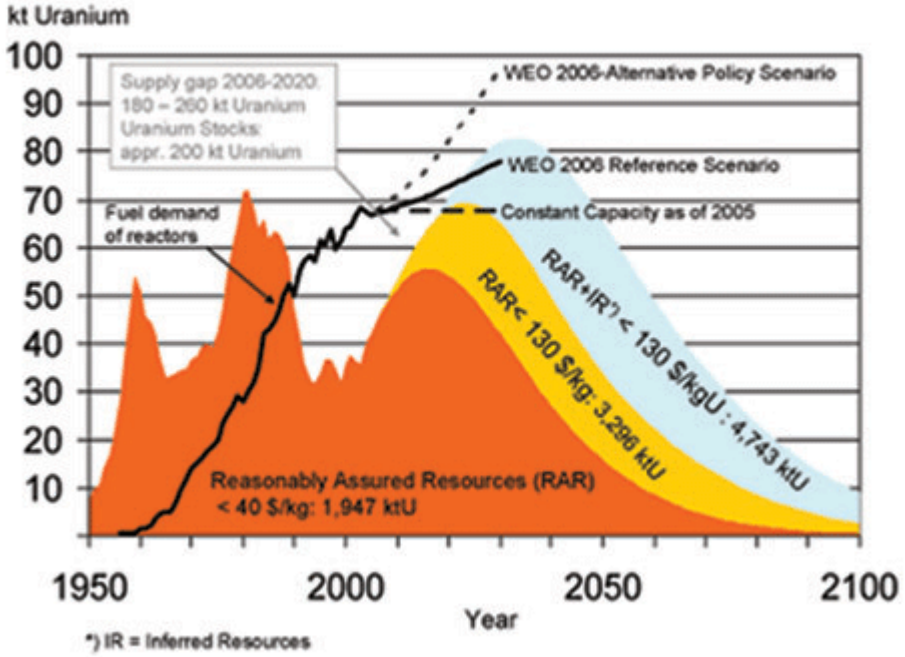
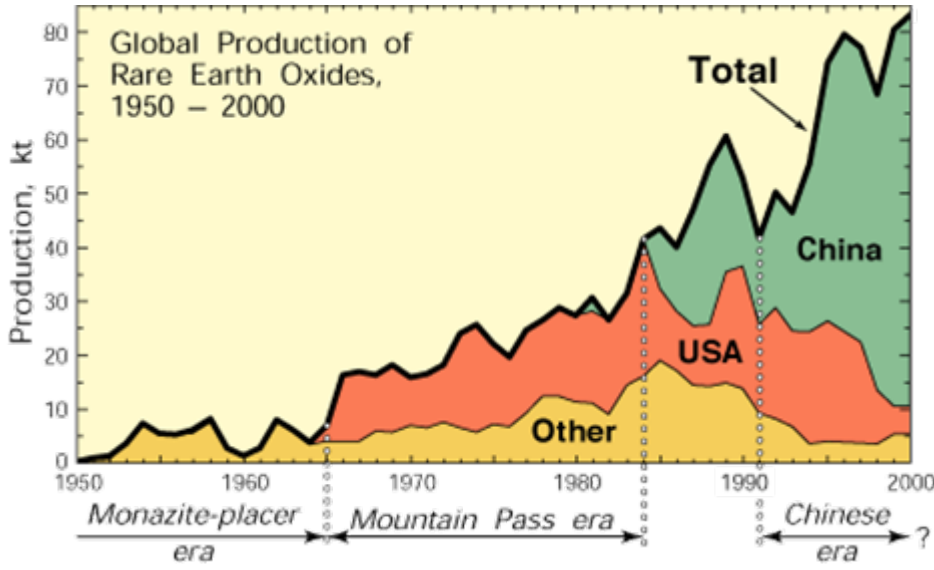
Competitiveness - resource

Uranium = not infinte, but SA in better position than most





Rare earth minerals – can SA regain market leadership?

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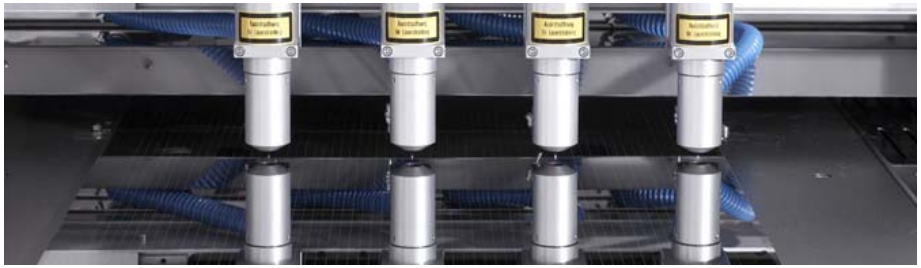
Competitiveness - tech



Alternative energy is more about manufacturing than construction.
All energy becomes cheaper with scale.

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Competitiveness - tech

New products and markets
for the automotive industry

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Competitiveness - trade

Table 1: Balance of Emissions Embodied in Trade (BEET) for select countries

Annex B			Non-Annex B		
	BEET $MtCO_2$	BEET as a % of production-based emissions		BEET $MtCO_2$	BEET as a % of production-based emissions
Switzerland	-63.1	-122.9%	Singapore	-62.8	-128.2%
Latvia	-4.6	-60.7%	South Korea	-45.4	-11.4%
United Kingdom	-102.7	-16.6%	Morocco	-2.5	-6.3%
Germany	-139.9	-15.7%	Mexico	-17.6	-4.5%
Japan	-197.0	-15.3%	Brazil	+2.5	+0.8%
United States	-438.9	-7.3%	India	+70.9	+6.9%
Canada	15.5	+2.8%	China	+585.5	+17.8%
Australia	57.9	+16.5%	Indonesia	+58.1	+19.0%
Russia	324.8	+21.6%	South Africa	+123.5	+38.2%

Source: Peters and Hertwich, forthcoming.

40% of SA GHG emissions are due to (embedded in) exports

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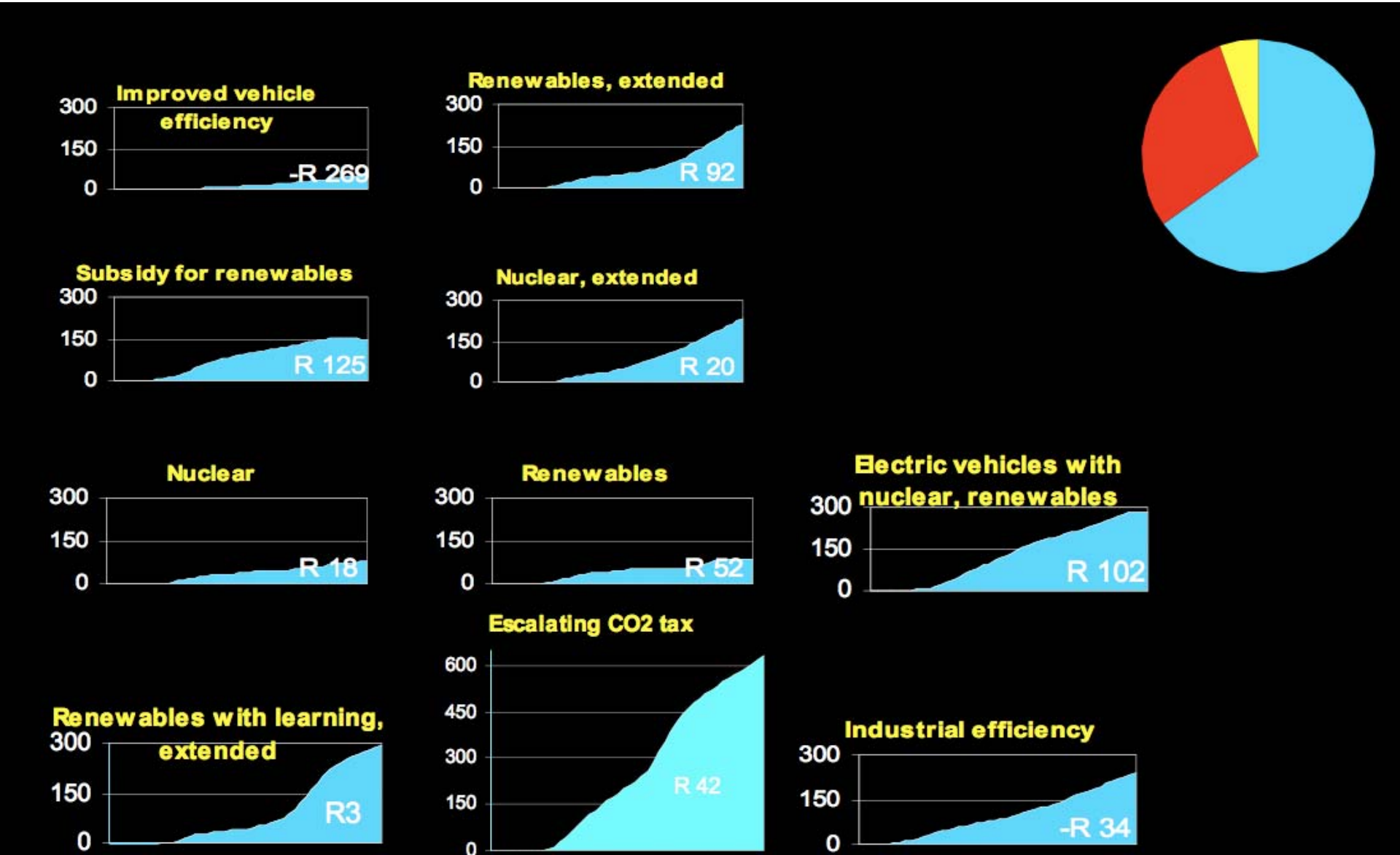
Big wins - climate



Big wins

Investment	Jobs	Competitiveness
Renewable energy: solar, wind, bio-energy [R10bn's each], Nuclear [R100bn's]	White collar: [5 000+] in planning, engineering, enviro-management…	Solar, coastal wind
Transport: EV (batteries) and public transport [R10bn's]	Blue collar: [20 000+] energy supply and savings component manufacture and installation	Water savings and waste water treatment
Energy savings: SWH, smart meter [R1bn's] (+ deferred power station investment)	Opportunities: [100 000+] in Working for's, land-based (eg. bio-energy) and recycling	Public transport: displace imports, working cities
ICT: Smart grids, buildings	Livelihoods: bio-energy, PV, PES [500 000+]	Motor industry: move to EV and redeploy skills + mnf. capacity

Costs

Coal (SCC with FGD) – EPRI (overnight)	R22 300/kW
Coal (SCC with FGD) – Kusile (overnight) (reported)	R20 600/kW
Coal (SCC with FGD) – Kusile	*R29 600/kW*
Nuclear (PWR) – EPRI (overnight) – Areva EPR	R28 400/kW
Nuclear (PWR) – EPRI (overnight) - AP1000	R33 200/kW
Nuclear (PWR) – Eskom Nuclear 1 quote (reported)	*R48 000/kW*
Wind – EPRI (50x2MW)	R15 500/max kW
Wind – EPRI (50x2MW) – 33% availability	R46 500/ave kW
Solar CSP – EPRI (Tower with 6 hours storage)	R32 200/dispatachable kW
Solar CSP – EPRI price – 50% load factor	R64 400/average kW
Solar PV EPRI (10MW thin-film ground-mounted)	R28 100/max kW
Solar PV EPRI – 20% availability	R140 300/average kW
Solar Waterheater – Eskom rebate ave. (R21 000/unit)	R31 100/kW displaced
Solar Waterheater – Basic unit, installed (R7000/unit)	R10 400/KW displaced
Multi-fuel stove – Fenix (heat and basic electricity)	R 9 500

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Cost savings in energy

33c/kWh covers Eskom's additional costs for existing stations.

25% x 3 goes towards Medupi and Kusile. This is because Eskom is not properly capitalized (> IPP opportunity)**.**

C**ost creep of 50% and 67%** for Medupi (R120bn i.s.o. R79bn) and Kusile (R142bn i.s.o R85bn) compared to the prices approved by the Eskom board in 2007 – partly due to bad timing of overheated market.

Cost savings in energy

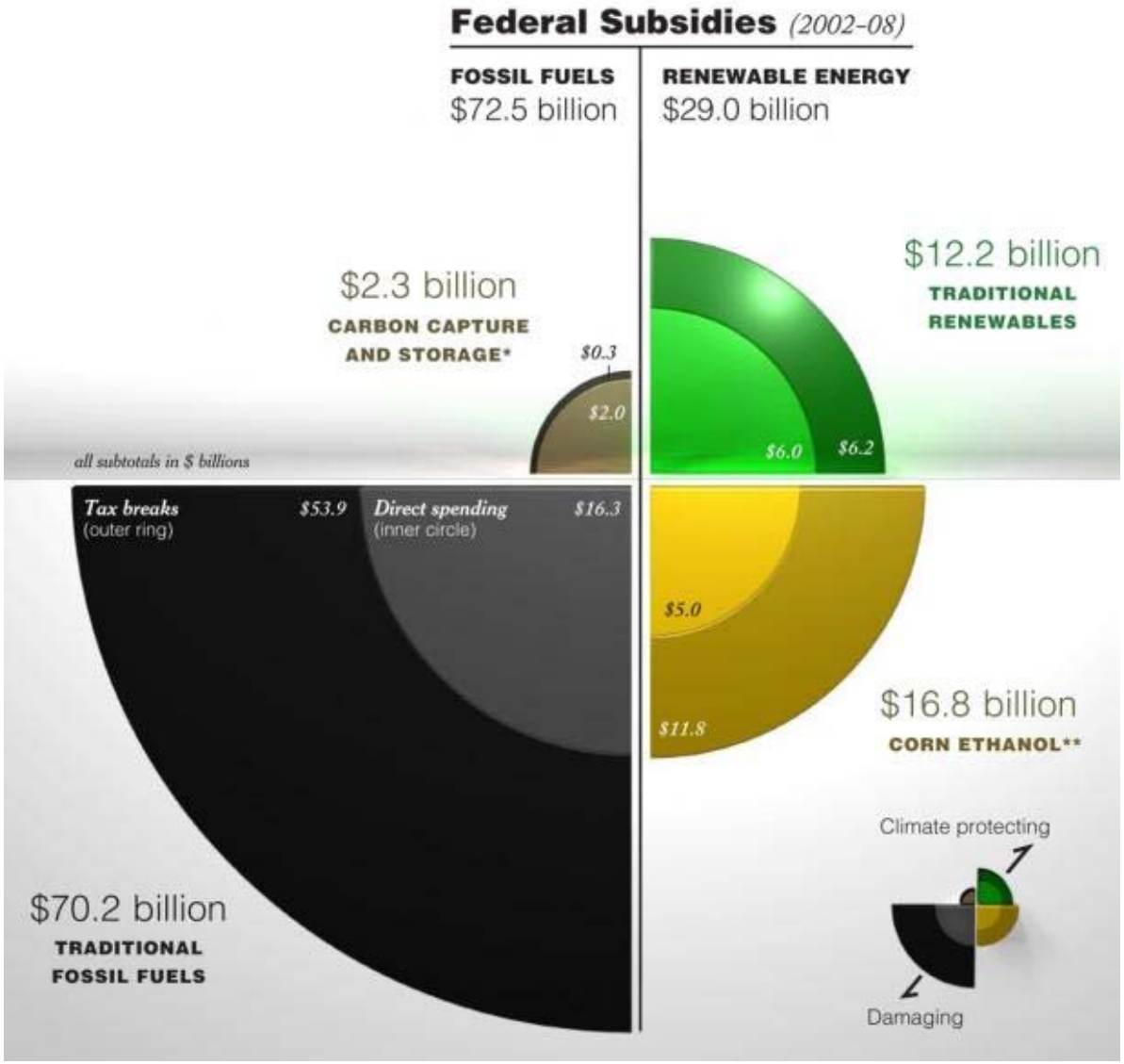
Medupi + Kusile would be 20% of total capacity
(40GW + 10GW = 50GW)

A 20% mix of IPP-supplied clean energy (co-gen, wind, solar) costing R1.50/kWh would raise the tariff from 33c/kWh to 58.6c/kWh **– an increase of 25.6c/kWh with rates fixed for 20 years.**

> LESS THAN 25% x 3

Generator units would be built in **many small (~100MW) installments** instead of two large 5 000MW chunks, **spreading risk** and allowing for **gradual financing**.

Perverse incentives



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Costs in the green economy

Subsidies will be required only for **public works**/"Working for's" where there is not a commercial incentive – this is justified by positive externalities in economic (water security), social (jobs, health) ++ The same externality benefits justify **preferential procurement**.

Public (municipal) expenditure for water, public transport **infrastructure investment and maintenance** (as per EPWP).

Domestic energy savings (SWH) currently subsidized, but need not be. Could be financed only (but subsidy provides additional incentive).

Efficient plant **tax breaks** (not in force) off-set by deferred public (Eskom) investment.

Feed-in Tariff for renewables (or co-gen) is paid for by consumers.

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Clean energy support

Clean Energy Policy Support in the G20 (*excluding Russia and Saudi-Arabia and with the addition of Spain)

Country	Invest-ment ($bn)	Ranking	Carbon Cap	Carbon Market	Renewable Energy Standard	Clean Energy Tax Incentives	Auto Efficiency Standards	Feed-in Tariffs	Government Procurement	Green Bonds
Argentina	0.080	18	X		X	X	X	X		X
Australia	1	14			X	X	X	X		
Brazil	7.4	6			X	X	X	X		X
Canada	3.3	8				X	X			
China	34.6	1			X	X	X	X		X
France	1.8	12		X	X	X		X		
Germany	4.3	7		X	X	X	X	X	X	
India	2.3	10				X	X		X	X
Indonesia	0.354	16			X	X		X	X	
Italy	2.6	9		X	X	X	X	X	X	
Japan	0.800	15			X	X	X	X		X
Mexico	2.1	11				X	X	X		
S. Africa	0.125	17						X		
S. Korea	0.02	19		X	X	X	X	X		X
Spain	10.4	5		X	X	X		X	X	
Turkey	1.6	13			X	X		X	X	
UK	11.2	3		X	X	X	X	X	X	X
US	10.6	2				X	X		X	
Rest of EU	10.8	4	X	X	X	X	X	X	X	X
G20 Total*	*105.4*		*2*	*7*	*14*	*18*	*14*	*16*	*9*	*8*

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Precedents

- **Sasol:** spin-off of public company, adopted innovation, commercialized at scale, tariff protection
- **Eskom:** cost reduction < massive scale, long-term contracts
- **Motor Industry Development Plan:** investment-targeted incentive to tap into global supply-chain
- **Developmental Electricity Pricing:** cost-saving for investors
- **Nuclear:** fleet buy, scale for localization

Recommendations

- **Transparency**
  (Beyond GDP, Integrated Planning, Sector and Product-level sustainability reporting)
- **Standards**
  (Buildings, appliances, incl. vehicles, accounting)
- **Differentiated pricing**
  (Supply-side: REFiT/Time-of-Supply,
  Demand-side: TREC/Time-of-Use,
  Economy-wide: Ctax/clean energy tax credits)
- **Procurement**
  (Public: Sustainable public procurement,
  Private: Supply-chain management)
- **Finance**
  (low interest RE finance for households and munics, RE bonds?)
- **Demonstration**
  (Full-scale with public-private risk-sharing and international cooperation)

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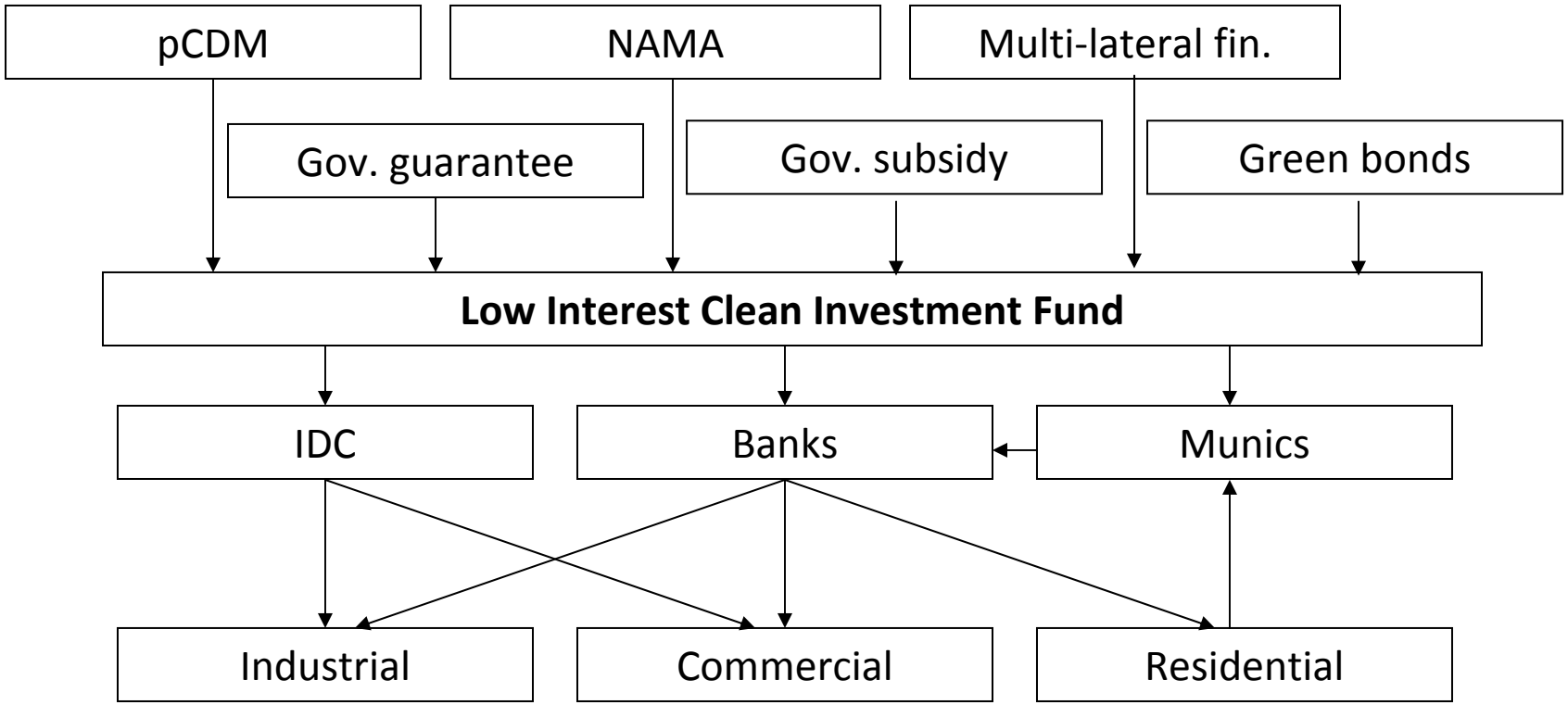
Finance vehicle



Climate funding

pCDM and/or NAMA's augment financial flows

"NAMAs may include:

(a) Sustainable development policies and measures;

(b) Low-emission development strategies and plans;

(c) Programmatic CDM, technology deployment programmes or standards, energy efficiency programmes and energy pricing measures;

(d) Cap-and-trade schemes and carbon taxes;

(e) Sectoral targets, national sector-based mitigation actions and standards, and no-lose sectoral crediting baselines;

(f) REDD-plus activities and other mitigation actions implemented in different areas and sectors, including agriculture."

(Source: UNFCCC/AGW-LCA negotiating text)

SA 1% share of $100bn/yr = $1bn/yr

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