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University of Fort Hare, ECSECC and Harold Wolpe Dialogue

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Topic:

THE GREEN ECONOMY:
NEW GLOBAL FAD? GREENWASHING? OR PROGRESSIVE AGENDA

Speaker:
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The aim of these dialogues is to create a space for open and informed dialogue and debate around key local and global political, social and economic issues facing South Africa.

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Growth, Resource Use and Decoupling: Towards a 'Green New Deal' for South Africa?[1]

Mark Swilling

Introduction

The 1994 democratic transition heralded unprecedented change. Virtually every facet of policy and practice in the emergent democratic state was reviewed and revised. A Bill of Rights forms part of the new Constitution and specifically guarantees the right of all South Africans to have the environment protected for the benefit of present and future generations. More pertinently, Section 24 (b) of the Constitution obliges stakeholders - in civil society and government - to "secure ecologically sustainable development". But reconciling complex and sometimes conflicting relationships between poverty, economic development and protection of environmental assets is a major challenge. In particular, the dominant economic growth and development paradigm fails to address a wide range of underlying resource constraints that can rapidly undermine the preconditions for the kind of developmental growth that is required to reduce inequalities and poverty over time. Remarkably, although the South African Government has systematically increased financial support for scientific research because it is believed that scientific knowledge reinforces development, this self-same community of scientists is generating research that raises very serious doubts about whether South Africa's resource-intensive economic growth path can continue in light of the rapid depletion and degradation of the country's natural resources (see Burns & Weaver 2008).

[1] . This case study is based on a report entitled Growth, Sustainability and Dematerialisation: Resource Use Options for South Africa by Mark Swilling, commissioned by The Presidency, South African Government, presented at the Workshop on Scenarios for South Africa in 2019, The Presidency, Pretoria, July 2007 (Swilling 2007).

This gathering scientific consensus (made possible by significant increases in state funding for scientific research almost exclusively in the natural sciences) has had limited impact on economic policy-making and virtually no impact on the underlying theories of economic growth that inform the thinking of the economic policy-making community. Government either needs to listen to the scientists and change the economic model, or explain why it chooses to ignore the science.

Global Context

There is a broad global consensus that we face the unprecedented twin challenge created by inter-linked economic and environmental crises. As the economic and environmental crises mutually reinforce one another, decision-makers across the public, private and non-profit sectors in both the developed and developing world intensify demands for practical solutions. A succession of global mainstream assessments over the past decade have together raised very serious questions about the sustainability of a global economic growth model that depends on material flows that have reached – or soon will reach – their natural limits (Barbier 2009; Gleick 2006; Intergovernmental Panel on Climate Change 2007; United Nations Environment Programme 2007; United Nations 2005; Watson *et al* 2008; World Resources Institute 2002; World Wildlife Fund 2008).

The crisis of resource depletion and the negative economic implications of climate change have even been be recognized by mainstream reviews such as the Stern Report (Stern 2007) which estimated the economic costs of climate change and the International Energy Agency, which finally acknowledged in 2008 that the "era of cheap oil is over" (International Energy Agency 2008).

Unfortunately, the scientific consensus reflected in the assessments cited above has had a very limited impact on mainstream economic policy-makers connected into World Bank/IMF networks. This is most clearly evident in the institutional economics of the so-called "post-Washington Consensus" as reflected in *The Growth Report* published by the *Growth and Development Commission* that brought together the most eminent actors in these networks (including Trevor Manuel). For this group of

economists, the only constraints to accelerating traditional modes of economic growth are institutional (Commission on Growth and Development 2008).

Resource limits are ignored, except for a distracted reference to the Stern Report and the 4th Assessment Report of the IPCC. However, there is a growing realization that economic policy making needs to respond to the severity of the global ecological crisis: Europe, China, South Korea, various progressive Latin American countries and the USA after Obama have adopted what are generally referred to now as "green economy" policies and strategies. During 2009 the G20 adopted resolutions supporting the idea of a 'Global Green New Deal'. Nobel Prizewinners Joseph Stiglitz and Amartya Sen headed a commission initiated by French President Sarkozy that recommended in 2009 that GDP is no longer an adequate measure of progress, suggesting that it be replaced by a Happiness Index (Stiglitz *et al* 2009).

This, combined with the European Union's "Green Growth" approach, is resulting in significant shifts. In October 2008 the 17th National Congress of the Communist Party of China endorsed President Hu Jintao's call for the building of a new "ecological civilization", which, according to Vice Premier of the State Council Li Keqiang, the Party has defined as the "summary of physical, spiritual and institutional achievements of human beings when they develop and utilize natural resources while taking initiative to protect nature." (Keqiang 2009) This has become the cornerstone of China's "green development" strategy, which is the strategic focus of China's massive economic recovery package. Unfortunately, in his Medium Term Budget Policy Statement in October 2009 South Africa's new Finance Minister, Pravin Gordhan, ignored the global scientific consensus about the ecological limits to growth and explicitly endorsed *The Growth Report.* This position effectively disconnects South Africa from the $100-$200 billion worth of investments in low-carbon development and contradicted South Africa's negotiating position at the Copenhagen Climate Change Conference in December 2009.

The key dimensions of the 'polycrisis' (Morin 1999) are now being recognised as global discussion of a 'Green New Deal' gathers momentum. Attention is increasingly on the intersections between global warming, eco-system breakdown, resource depletion, the global economic crisis, persistent poverty and accelerating urbanization

(without adequate investments in urban infrastructure). Global warming by a minimum of 2 degrees centigrate, exacerbated by the 70% increase in GHG emissions between 1970 and 2004 described in the 4th Assessment Report of the IPCC, is both an outcome of an unsustainable economy and the most significant catalyst for change (Intergovernmental Panel on Climate Change 2007). As the Stern Report made clear, poorer countries will suffer "first and most" from the consequences of global warming even though they have "contributed least" to global warming (Stern 2007). The global economic crisis will exacerbate this suffering as the global economy shrinks with recovery projected to take anything between three and ten years. According to the International Labour Organization, the number of unemployed in developing countries may rise by the end of 2009 by between 18 and 51 million people over 2007 levels (cited in Barbier 2009). When food prices rose by almost 60% during the first half of 2008, the number of people living in poverty increased by between 130 and 155 million (cited in Barbier 2009).

The International Energy Association predicted in 2008 that demand for oil will increase by 45% by 2030 without any evidence that it will be possible to find this amount of oil at affordable prices as the costs of extraction across the world's oil fields rise as the quality and quantity of reserves decline, thus further undermining traditional drivers of economic recovery. It's 2008 World Energy Outlook report concluded that the "the era of cheap oil is over" (International Energy Agency 2008).

It is therefore unsurprising that oil prices have tended to rise over the past year despite recessionary conditions. Predictions that oil could rise to $180/barrel in the relatively near future are now quite common (Barbier 2009).[2] The Millennium Ecosystem Assessment found that 15 out of 24 key eco-system services are degraded or used unsustainably, often with negative consequences for the poor – 1.3 billion people live in ecologically fragile environments located mainly in developing countries, half of whom are the rural poor (United Nations 2005). At the same time, as the world's population grows from the current 6 billion to 8 billion by 2030, a massive urbanisation wave is underway – what the 2006/7 State of the World's Cities report

[2] . There is a significant difference between the notion that "the era of cheap oil is over" and the notion that we have reached, or are about to reach, "peak oil". The latter notion is based on the assumption that there will be decline in total production of oil, whereas the former is more concerned with the implications of rapidly rising oil prices for a global economy that depends on oil to meet 60% of its energy needs.

called the ‘second wave of urbanization’ - that has already pushed us across the 50% urbanised mark (United Nations 2006). The inevitable result is the unprecedented expansion and creation of new cities as the number of urbanites in the developing world increases from 309 million in 1950 to a staggering 3.9 billion by 2030. African and Asian cities will absorb the additional two to three billion people that are expected to living on the planet by 2050, even though they are the least equipped to handle this challenge (United Nations 2006).

It has been estimated that the combined value of the fiscal stimulus packages assembled by the G20 in 2009 is between US$2 and 3 trillion, or 3% of global GDP (Barbier 2009). If these stimulus packages focus exclusively on economic recovery and ignore global warming, eco-system breakdown, the end of cheap oil and global poverty, the outcomes will contradict the original recovery intentions. Even in the USA it has been recognized that economic recovery investments must be coupled to investments in more sustainable use of resources: of the US$827 billion to be spent by the US Government, US$100 billion has been allocated to green investments. South Korea has an ambitious Green New Deal investment package worth US$36 billion which comprises the bulk of its recovery package, and China has earmarked 38% of its recovery package (equal to 4 trillion yuan) for green technology investments. These examples testify that the causes of the current crisis are being recognised and are far more complex than merely short-term economic factors. They are also investments that will drive unprecedented rates of innovation as governments and private sector players strive to convert these investments into competitive advantages within the global economy. This logic was reflected in a shift in global ideological discourse expressed most clearly by UK Prime Minster Gordon Brown when he wrote in *Newsweek:*

> There can be little doubt that the economy of the 21st century will be low-carbon. What has become clear is that the push toward decarbonisation will be one of the major drivers of global and national economic growth over the next decade. And the economies that embrace the green revolution earliest will reap the greatest economic rewards. ... Just as the revolution in information and communication technologies provided a major motor of growth over the past 30 years, the transformation to low-carbon technologies will do so over the

> next. It is unsurprising, therefore, that over the past year governments across the world have made green investment a major part of their economic stimulus packages. They have recognised the vital role that spending on energy efficiency and infrastructure can have on demand and employment in the short term, while also laying the foundations for future growth." – *Newsweek*, 28 September 2009

Although Brown recognizes here that a new industrial growth path is required, his Government continues to support the continued financialisation of the UK and global economy which is, ultimately, about debt-driven consumption of goods produced in low-wage regions that, in turn, require very cheap natural resource inputs. This is not the kind of model that can deliver a "green revolution".This argument has been confirmed by the work of a new UNEP Panel established in the wake of the 4th Assessment Report of the IPCC, the United Nations Environment Programme. The International Panel for Sustainable Resource Management (IPSRM) has highlighted the crucial role that material resource flows and associated environmental impacts (see http://www.unep.fr/scp/rpanel/biofuels.htm). By resource flows we mean primarily the metabolic flow of fossil fuels, biomass, minerals and metals through the global economy. The focus is on extraction and domestic use of materials quantified in tons. The aim is to analyze the relationship between economic growth and resource use. Material Flow Analysis (MFA) is the methodological tool that is used to conduct this analysis. MFA has matured over the past five years and has become an established method for assessing the sustainability of local, national and global economies (Bringezu & Schutz 2001; Bringezu & Bleischwitz 2009; Bringezu *et al* 2004; Fischer-Kowalski 1998; Fischer-Kowalski 1999; Haberl *et al* 2004; Krausman *et al* 2008; see Krausmann *et al* forthcoming).

Using MFA it has been possible to compute global material flows for the first time. These flows include fossil fuels, biomass, minerals and metals. Over the period of accelerated globalization and financialisation since 1980, total extraction of all these resources has increased by 36%, from 40 billion tons in 1980 to 55 billion tons in 2002.

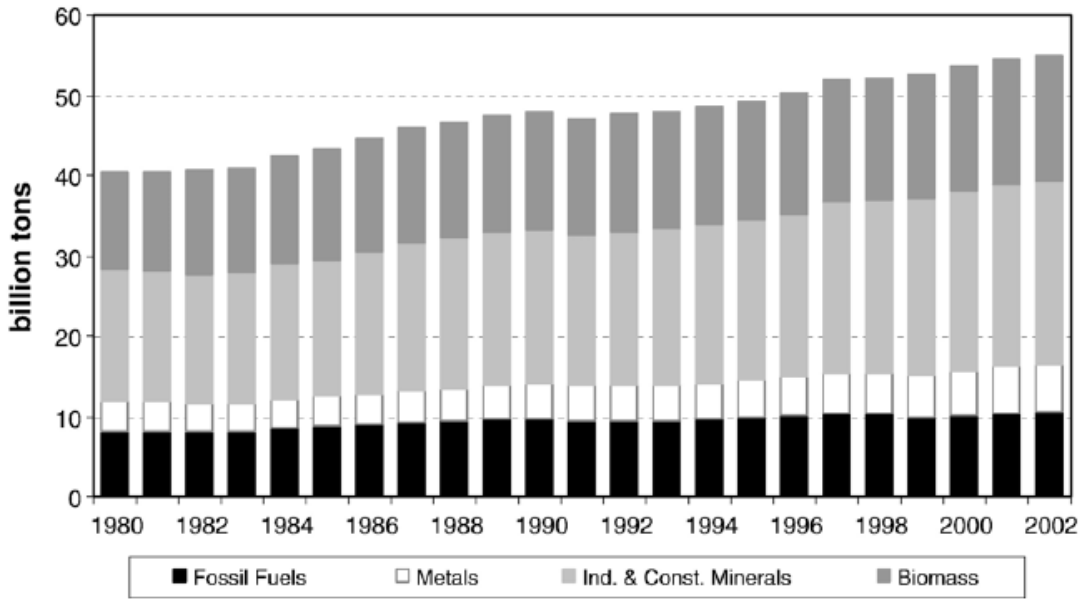


Fig. 1 – Global used resource extraction by material category (in billion tons).

(Source: Behrens *et al* 2007)

Increased resource extraction has not, however, resulted in greater equity. The 1998 United Nations Human Development Report demonstrated that by the end of the 1990s the richest 20% of the world's population was responsible for 86% of consumption expenditure, whereas the poorest 20% were responsible for only 1.3% of consumption expenditure (United Nations Development Programme 1998) . In other words, as total domestic consumption shot over the 50 billion ton/annum mark in the late 1990s, 20% of the world's population had the means to purchase 86% of this harvest. This, in turn, was made possible by declining real prices of primary resources, with negatives consequences for Africa's resource-rich resource-exporting countries. Indeed, a World Bank report estimated that these prices were lower than the real value of these resources, which means that many African countries (including South Africa) have experienced a decline in their Gross National Incomes (which includes the value of financial, human and natural capital) as exports of primary resources have increased (World Bank 2005).

The IPSRM developed three 2050 scenarios (assuming that there will be 9 billion people on the planet by this time), comparing these to the year 2000 'baseline scenario' of 55 billion tons of extracted material (Swilling *et al* 2009). It was

demonstrated that the current metabolic rate is between 8.5 and 10 tons of materials per capita. The average rate in industrialized countries is double this rate, with rates going up to 25 and 40 tons per capita in low density developed economies like the USA and Australia. The metabolic rate of almost two thirds of the world population who also live in developing countries is 5-6 tons. Three scenarios were evaluated, the first being a business-as-usual scenario that will take the global economy from the current 55 billion tons of extracted materials per annum to 140 billion tons. There is no scientific evidence that the resources exist (fossil fuels, metals, biomass) to sustain this 'business-as-usual' scenario. The second and third scenarios are more sustainable arriving at 75 billion and 55 billion tons respectively per annum. Scenario two (75 billion tons/annum) is in line with the gradual change scenario envisaged by the IPCC, while the third scenario is more in line with radical changes suggested by eco-system science, which presumes that a global agreement is reached to stabilize at the current level of extraction and material use.

The IPSRM brings together two well consolidated intellectual traditions, namely industrial ecology and ecological economics. These traditions, which agree with those of institutional economists, are key but go further by emphasizing the ecological constraints to growth. They share the view that a new economic theory is required that makes it possible to conceptualize the economic modalities of a "Green Economy", i.e. an economy that grows by reducing rather than increasing resource consumption, or what in the literature is referred to as 'dematerialisation'. The core concept at the centre of this work is 'decoupling'. The notion of decoupling opens up a new way of thinking about the relationship between the rate of economic growth and the rate of resource consumption and its associated impacts. This implies two types of decoupling: 'resource decoupling' which refers to decoupling growth rates from resource extraction, and 'impact decoupling' which refers to decoupling growth rates from environmental impacts. Furthermore, it is possible to make a distinction between 'relative decoupling' and 'absolute decoupling': the former implies slower rates of resource use and impacts relative to economic growth rates, while the latter refers to negative rates of growth of resource consumption and related impacts. Policy and strategic decisions can be made that foster the relative/absolute decoupling of both resource use and impacts in contextually specific ways that reduce the significance of resource limits as a constraint to growth (Swilling *et al* 2009). The inevitable result

will be the redefinition of growth, or what the Latin American ecological economist Gilberto Gallopin has called “non-material growth”, which he distinguishes from the European notion of “zero growth” (Gallopin 2003).

Decoupling makes it possible to think about the connections between economic growth, improved wellbeing through development and sustainable resource use in ways that open up more creative options for innovation than has hitherto been the case. After the Club of Rome report in the early 1970s, there was a pervasive assumption that growth was the cause of environmental destruction and therefore sustainable development would only be achieved through zero growth strategies. This conception was only tenable because the relationship between economic growth and resource use was seen to be directly proportional to one another. For the Brundtland Commission Report the focus was on how best to ‘sustain’ development (conventionally defined) and the only limits that mattered were institutional and technological factors, not natural resource constraints. The inter-substitutability of different forms of capital that Brundtland legitimized effectively reduced the conceptual space for decoupling. The result is that both developed and developing countries have been allowed to validate resource intensive growth paths to eliminate poverty. These are now coming up against the natural resource limits that have hitherto not received significant attention.

Both resource and impact decoupling are necessary – one without the other will prove ineffective when it comes to realizing sustainability goals. In so doing, our understanding of economic growth also changes. Instead of seeing economic growth as inevitably driven only by value derived from an increasing quantity of material goods and assets, so-called ‘non-material growth’ (or prosperity or well-being) is driven by knowledge intensity and associated investments in culture, livability, education, improved health, environmental quality, safety, a sense of place and (individual and collective) capabilities for enhancing wellbeing and freedom.

Developing countries should not regard the call for sustainable resource management as a threat to development and poverty eradication. On the contrary, sustainable resource management offers new opportunities for investments in innovations that could stimulate endogenous growth strategies in developing economies. These could

be more effective in eradicating poverty than traditional strategies that depend on primary exports or exports of cheap manufactured goods underpinned in both cases by resource depletion and/or environmental degradation. As oil prices rise, long distance trading regimes will be forced to restructure – the sooner developing countries prepare for this eventuality, the better off they will be when it happens. Unfortunately, most developing countries think that sustainable resource management only refers to costly impact decoupling. Resource decoupling is where the economic opportunities for developing countries lie, and impact decoupling reinforces adaptation with major benefits for millions of poor people who depend on the ecological sustainability of eco-system goods and services (such as fishing, indigenous forests, good soils and stable climates and their associated predictable rains).

Limits of Resource Intensive Growth[3]

It is becoming increasingly apparent that key ecological thresholds in South Africa are being breached by its prevailing approach to growth and development, and that this is resulting in dysfunctional economic costs. This condition of rising costs caused by a new set of material, ecologically driven constraints sets the context for new ways of thinking about the country's economic growth model and poverty reduction strategies. Since the first democratic elections in 1994, South Africa has experienced an unprecedented growth period that came to an end towards the end of 2008. As a resource-rich resource exporting country, South Africa benefited from the rise in commodity prices over the past decade, but suffered as they collapsed temporarily during 2008 as a result of the global financial crisis. Figures 1 and 2 demonstrate this growth period, and how economic growth has correlated with employment growth, which is a key strategy to reduce poverty.

[3] This section is based primarily, but not exclusively, on background research materials commissioned to inform the writing of the National Framework for Sustainable Development that was adopted by Cabinet in June 2008. The materials were circulated publicly and most are available on www.deat.gov.za. The commissioned research papers are referenced in the subheadings that follow, and additional research integrated where necessary. Because this section relies quite heavily on these papers, they are not specifically referenced in detail. The supporting research and backup references can be found in these commissioned papers.

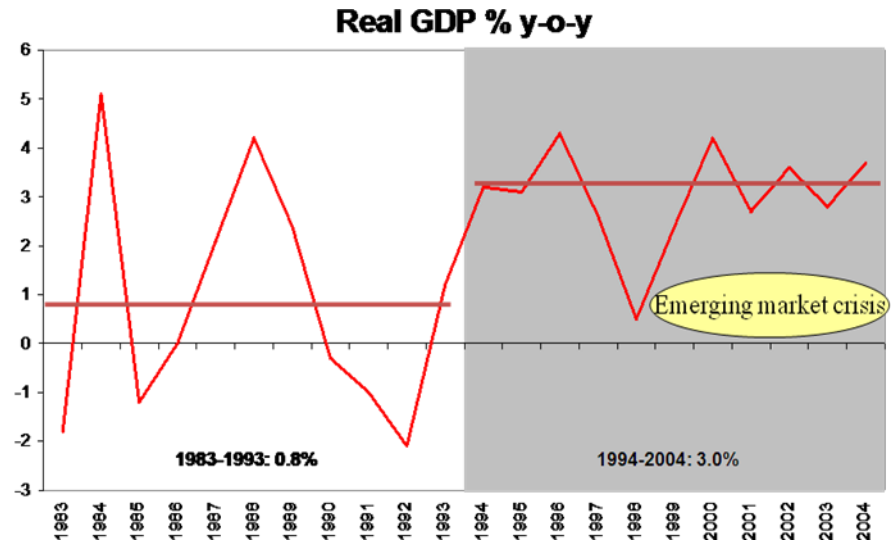


Figure 1 - Real GDP growth 1983 – 2004

(Source: Republic of South Africa: National Treasury 2006)

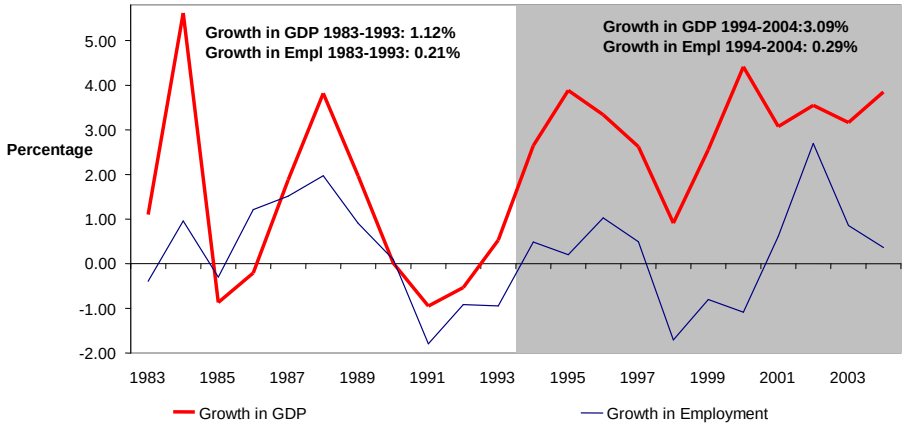


Figure 2 - GDP and employment growth 1983 – 2004 (non-agricultural sectors)

(Source: Republic of South Africa: National Treasury 2006)

South African economic growth has been driven by a combination of expanded domestic consumption financed by rising levels of household debt (securitized against residential properties) and exports of primary resources which entrenched the hegemony of the so-called ‘mineral-energy complex’. The manufacturing sector has,

unfortunately, declined relative to other sectors in response to a vigorous strategy to lower import tariffs and liberalise the capital markets (thus favouring investments in liquid assets rather than long-term fixed investments). Figures 3 to 5 below reveal the rise in consumption spending and the relative decline in the growth of the manufacturing sector.

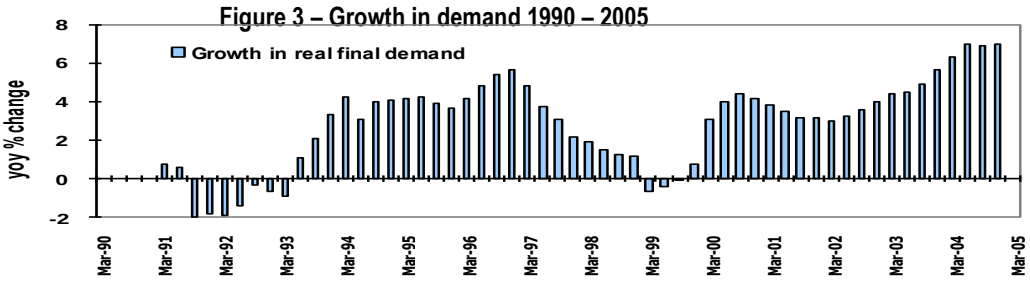


Figure 3 – Growth in demand 1990 – 2005

(Republic of South Africa: National Treasury 2006)

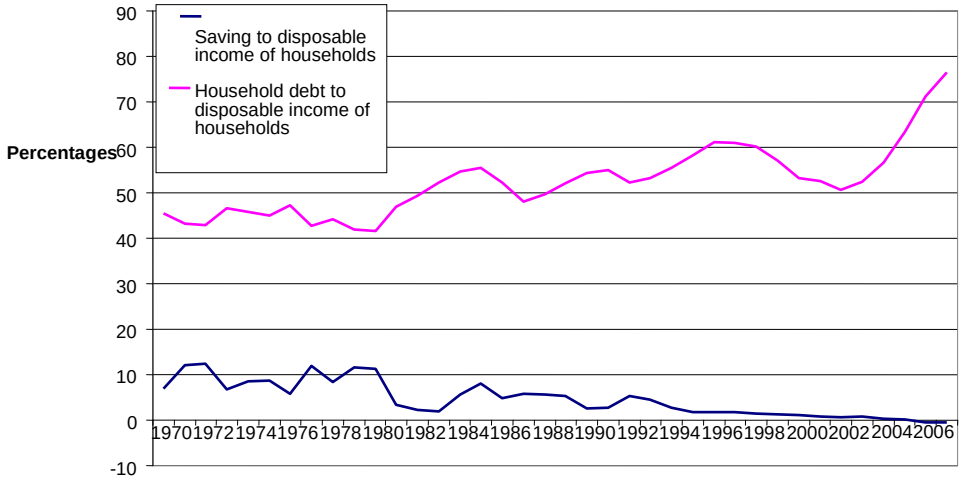
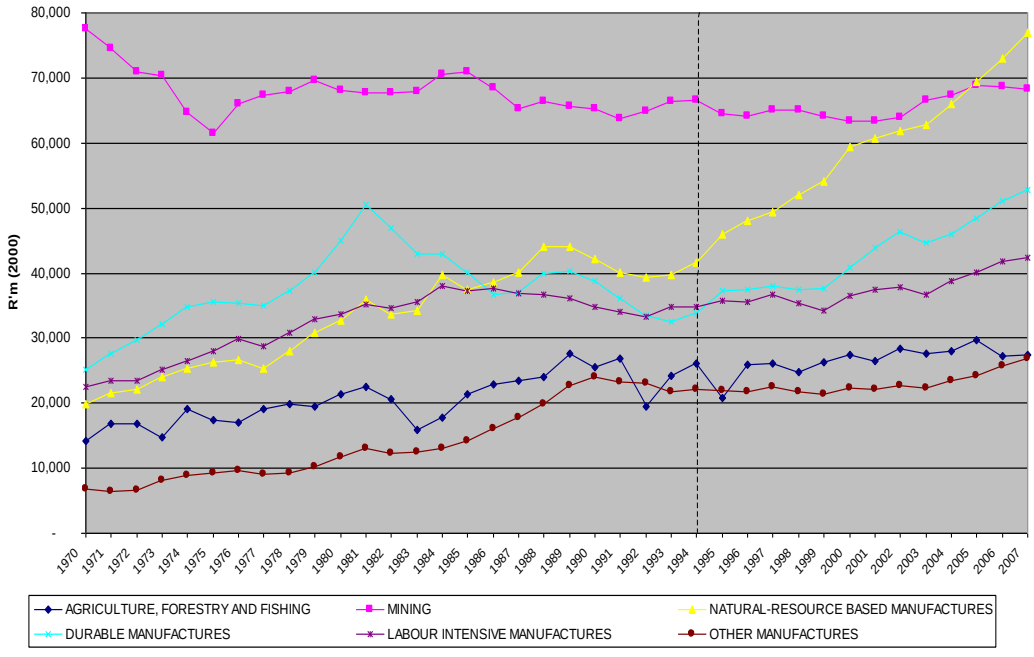


Figure 4 – Household Saving and Debt 1970 – 2006

(Mohamed 2008)

The growth in final real demand is shown in Figure 3, but when read against rising debt levels and the declining contribution of manufacturing relative to mining and natural resource industries as reflected in Figure 5, it is clear that debt-financed consumption has been the driver of consumer demand for an increasing quantity of imported products, while growth has shifted to an *increasing* reliance on the extraction and export of natural capital. The balance of payments pressures this created was at first mitigated by the beneficial impacts of rising commodity prices. But with the global economic crisis, both easy credit to drive consumption and high commodity prices came to an end, although it is clear that commodity prices are steadily rising as China and a few other industrialising developing countries continue to grow at much higher rates than the global average. This dependence on the so-called "mineral-energy complex" and debt-financed consumption-driven growth is quintessentially the core structural problem at the heart of the South African economic crisis (see Mohamed in this volume and Fine & Rustomjee 1996).

Figure 5: Sector Value-added, 1970-2007, R'm (2000



(Source: *Source:* Quantec RSA Standardised Industry Database)

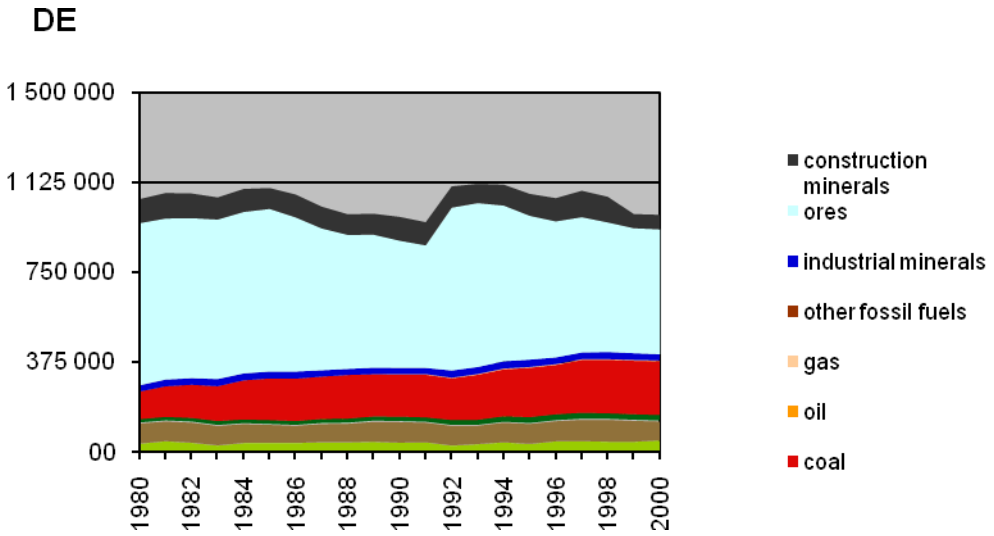


Figure 6 – Domestic Extraction in millions of tons, 1980-2000

(Krausman *et al* 2005)

Figure 6 reveals the significance of ore extraction, although it has declined since 1980. At the same time, coal extraction has increased to fuel the coal-based electricity generation industry, which supplies the cheapest electricity in the world to South Africa's economy. The low price coal and mineral policy has resulted in limited diversification of the economy and high levels of inefficiency.

Despite the dependence on ore and coal extraction, there is also evidence of decoupling in the 20 years leading up to 2000 as revealed in Figure 7:

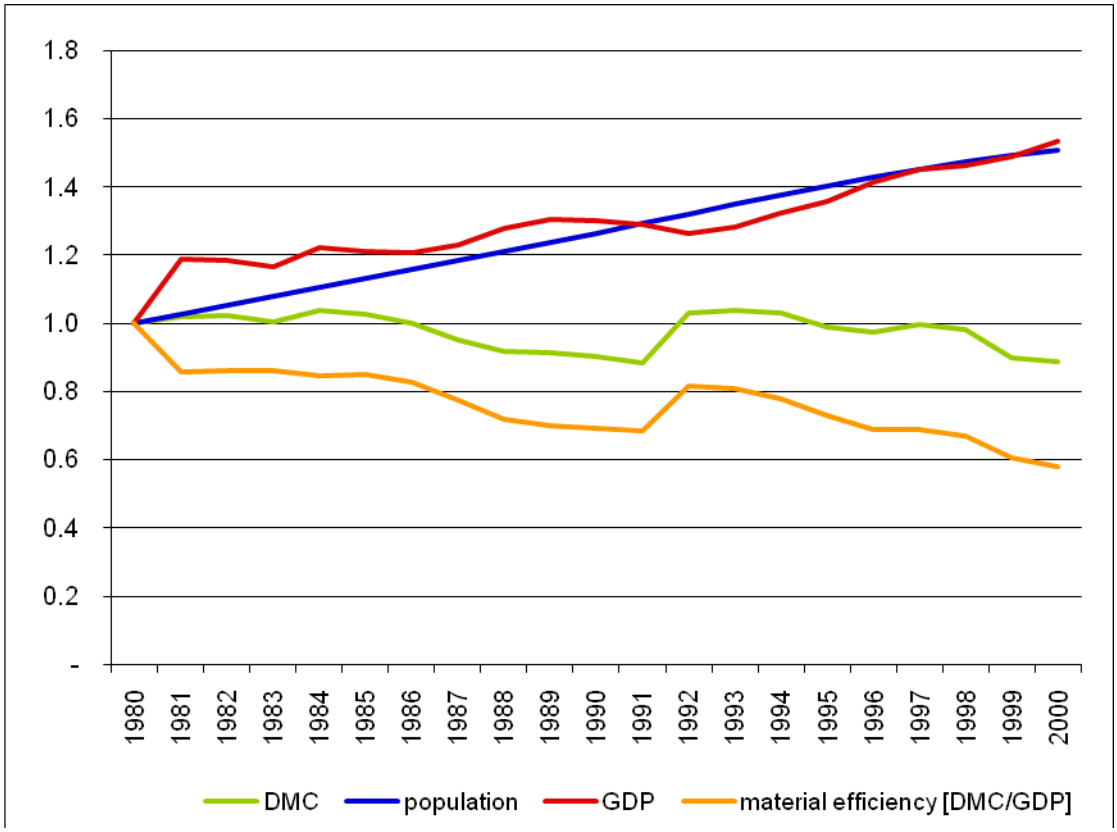


Figure 7– Material efficiency 1980 – 2000 (Krausman *et al* 2005)

Although based on a limited study, Figure 7 does suggest that a relatively minor level of decoupling is taking place – domestic material consumption (DMC) of primary materials[4] has declined while population growth and GDP have grown. Figure 8 reveals the significance of exports of primary resources for the SA economy. South Africa's economy is still dominated by the so-called 'mineral-energy complex' which, in turn, has managed to convince government that economic growth by selling off natural capital (coal and ores) at very low prices makes economic sense. This led to the strategically senseless decision to sell ISCOR to Mittal Steel with a back-to-back agreement that Mittal could buy South African iron ore for cost plus 3% forever. This is why Mittal could testify at the Competition Tribunal that its South African operations are the most profitable compared to the rest of its other global operations. Workers, in the end, paid the price as steel prices pegged to the international price of

[4] Domestic material consumption is the sum of domestic extraction of primary resources, plus imported primary resources, minus exported primary resources.

steel increased the costs of production thus placing downward pressures on wages, and increased the costs of construction thus making housing and infrastructure delivery more expensive.

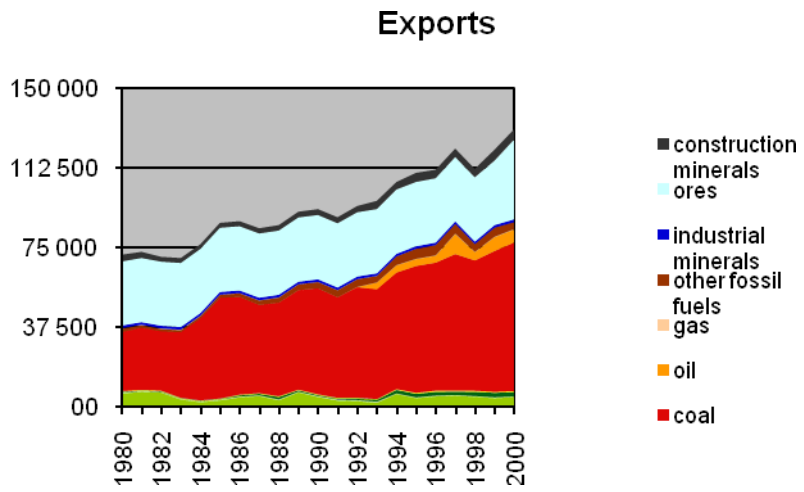


Figure 8 – Primary Material Exports 1980 – 2000 (Krausman *et al* 2005)

In short, South Africa is a good example of an economy caught up in the financialisation of a globalised economy, with debt-driven consumption as the key driver of growth. This has undermined manufacturing as tariff barriers have been lowered and cheap imports from Asia have risen. It has also resulted in debt-financed consumption spending, and increased dependence on revenues from exported primary resources at low prices. The unsustainability of this growth strategy is partially recognised by the Government and key stakeholders and various interventions are being considered by a wide range of state institutions, including the Department of Environmental Affairs, National Treasury, Department of Trade and Industry, Department of Human Settlements, Department of Energy, Department of Water Affairs, Department of Transport and key financial institutions such as the IDC and DBSA. However, South Africa is a robust constitutional democracy with three layers of Government (National, Regional, Local) that are, in turn, relatively independent

from one another. This has resulted in very low levels of intra-governmental co-ordination. Each sector responds to the sustainability challenges in their own way. What is lacking is a government-wide approach that connects industrial policy, resource management strategies and protection of eco-system services.

However, 2010 is slated as a key year for consolidating the Green Economy policy framework, which could become the focus of the newly established National Planning Commission. In February 2010, the Cabinet approved a Department of Environmental Affairs document entitled *Proposals on Green Jobs – A South African Transition.* This will be followed up by a comprehensive strategy document called *National Green Economy Strategy* which will be considered at the Cabinet Legotla in July 2010 which is fairly soon after the Green Economy Summit planned for 19-21 May. Both the IDC and DBSA are working together with the Department of Environmental Affairs to work out detailed financial plans for implementing the Green Economy Strategy. In the meantime, the Gauteng Government has adopted what it calls a "Developmental Green Economy Strategy" that is heavily focussed on decoupling by targeting investments in renewable energy, water efficiency, recycling of solid and liquid wastes, moving people into public transport and massively increasing locally produced food to improve food security and create jobs.

Whether these initiatives amount to a coherent, effective policy outcome and implementation strategy remains to be seen. What follows is a consideration of various sectoral responses.

Resource Limits

Climate Change[5]

Using Global Climate Models the following changes to the South African climate within the next 50 years were predicted, with drastic impacts on national water availability, food and biomass production capacity, incidence of disease and the country's unique biodiversity:

[5] Based on the work of the Scenario Building Team 2007, Department of Environmental Affairs and Tourism 2005a

- continental warming of between 1 and 3°C;
- broad reductions of approximately 5 to 10 % of current rainfall;
- increased summer rainfall in the northeast and southwest, but reduced duration of summer rains in the northeast;
- nominal increases in rainfall in the northeast during winter season;
- increased daily maximum temperatures in summer and autumn in the western half of the country;
- extension of the summer season characteristics.

CO_2 is South Africa's most significant greenhouse gas (GHG), contributing more than 80% of its total GHG emissions for both 1990 and 1994. The main source of CO_2 emissions is the energy sector, which generated 89.7% of total CO_2 in 1990 and 91.1% in 1994. These high emission levels relate to the high energy intensity of the South African economy, which depends on large scale primary extraction and processing, particularly in the mining and minerals beneficiation industries. Although still a developing economy, its energy intensive nature and its dependence on coal-driven energy sources results in an extremely high carbon emission level per unit of GDP compared to the rest of the world:

Area	**Population (million)**	**GDP per capita**	**Carbon Footprint (CO_2 emissions per capita (tons))**	**Carbon Intensity (CO_2 emissions per unit of GDP)**
South Africa	46.6	$ 10,715	9.8	0.99
SubSaharan Africa	781.3	$ 1,945	1.0	0.57
USA	293.6	$ 40,971	20.6	0.57
OECD	1160.5	$ 28,642	11.5	0.45
World	6389.3	$ 9,348	4.5	0.55

Source: UNDP 2008

Table 9 - Comparative carbon emissions 2004

In July 2008 the Cabinet adopted a document generally known as the Long Term Mitigation Scenario (LTMS) which was commissioned by the Department of Environmental Affairs and Tourism and compiled mainly by a group of University of Cape Town researchers. This report produced two primary scenarios, namely the '*Growth without Constraints Scenario'* and the *'Required by Science Scenario'*. The first models long-term implications of current economic policy, and concludes that emissions will grow from 440 megatons of CO_2-eq in 2004 to 1600 megatons of CO_2-eq by 2050. This would involve rising fuel consumption by 500%, building 7 new coal-fired power plants or 68 Integrated Gassification plants, constructing 9 conventional nuclear and 12 Pebble Bed Modular Reactor (PBMR) plants, and introducing five new oil refineries. Renewable energy will play a negligible role. The *'Required by Science Scenario'* envisages very radical interventions to position South Africa in a post-carbon world. The result would be a 30-40% reduction of CO_2-eq emissions by 2050 from 2004 levels. The scenario views this ambitious programme of extreme decoupling as necessary, but admits it cannot be reliably costed as the required technologies must still mature. The LTMS document was adopted by the South African Cabinet in July 2008, with a commitment to the *Required by Science Scenario* as the preferred option. This has major implications for economic and development policy. However, there is limited evidence that these implications have been registered. The 2009 Medium Term Policy Framework acknowledged the need to address this issue, but there was no reference to the drastic structural changes required and the intellectual adherence to the logic of the *The Growth Report* means that climate change policy has not been understood by the Treasury.

Oil Resources[6]

Imported oil meets approximately 16% - 20% of South Africa's energy needs. Figure 10 illustrates that if demand for liquid fuels in South Africa (essentially the hydrocarbons petrol, diesel and jet fuel) is driven by current transport demand patterns and transport modes, even modest growth rates of 3% and 6% per year would lead to increases of 1.8 and 3.2 times present (2004) volumes.

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[6] Based on the work by Jeremy Wakeford (2007).

											Low Growth Rate (3%)	High Growth Rate (6%)
Year	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2024	2024
Petrol	10153	10566	10798	10883	10861	10396	10340	10335	10667	10985	19840	35230
Diesel	5432	5759	5875	5959	5993	6254	6488	6831	7263	7679	13869	24628
Jet Fuel	1368	1601	1777	1877	1995	2020	1924	1967	2099	2076	3749	6658

(Source: Cairncross 2005)

Table 10 Past and projected consumption of transportation fuels (million litres/ year)

Current macro-economic policy documents do not address the challenge of peak oil. There is no estimate of the rate of increase of the oil price, nor is there an assessment of the potential impact if oil prices continue to rise, as they inevitably will. The combination of growing demand and rising prices will severely undermine economic growth and poverty reduction measures. It follows that either growth rates must be revised downwards, or massive investments are required to substantially reduce consumption of imported hydrocarbons.

Energy[7]

Just over 70% of South Africa's energy is derived from coal. This is a long-term trend and will more than likely continue well into the future. The remaining 30% is derived from oil (20%), gas (1.5%), nuclear (3%) and biomass (5.1%). Significantly, coal-to-liquid and gas-to-liquid technologies accounts for 30% and 8% respectively of the total liquid fuel supply.

Cheap energy (possibly the cheapest in the world) and abundant coal supplies have made it possible to build an energy intensive economy. Figure 11 reveals how resource intensive the South African economy is compared to other parts of the world.

	TPES/capita	**TPES/GDP**	**TPES/GDP**	**Elec. Consumption per capita (national average)**
	Toe/capita	**Toe/ 000**	**Toe/ 000 PPP**	**kWh/capita**

[7] Based on AGAMA Energy 2005

		1995 US$	1995 US$	
South Africa	2.51	0.63	0.29	4,533
Africa	0.64	0.86	0.32	503
South Korea	4.10	0.31	0.30	5,901
Indonesia	0.69	0.70	0.25	390
Non-OECD	0.96	0.74	0.28	1,028
OECD	4.78	0.19	0.22	8,090
World	1.67	0.30	0.24	2,343

Key: TPES = total primary energy supply, toe = tones of oil equivalent, PPP = purchasing power parity (i.e. adjusted to remove distortions of exchange rates), GDP = Gross domestic product.

Table 11 - Energy intensities

The biggest future challenge for the energy sector is the rapid growth in electricity demand without a clear plan to increase generation capacity. Expanding access to electricity by poor households and the imperatives of a growing economy put increasing pressure on supply. Peak demand started to outstrip supply in 2006/7, resulting in rolling blackouts across the country with negative economic consequences.

To date policy-makers have paid little attention to large-scale energy efficiency (EE) and renewable energy (RE) interventions. The White Paper on Renewable Energy (November 2003) identified a RE target of 4% by 2013 and a 12% reduction in energy consumption by 2014. Scenario building exercises have provided evidence that up to 50% of South Africa's future energy supply could stem from RE by 2050. However, for this to be realised, planning and investments need to proactively focus on this long-term trend. In other words, there is agreement that the energy sector must be dematerialised, but no agreement on how far this should go or on the balance between RE and EE.

In the short term, immediate electricity generation needs will be met by re-commissioning old coal-fired power stations and by escalating R&D support for the controversial Pebble Bed Modular Reactor (PBMR)[8]. But the long-term financial viability and security of nuclear power remains uncertain. Short-term high impact

[8] . Although towards the end of 2009 there were confirmed reports that Government was considering shelving the PBMR.

investments in proven wind and solar power technologies could rapidly create the basis for a long-term supply of renewable energy. The fact remains that investments to date in the PBMR technology could have supplied a solar hot water heater for free to every household in South Africa. A solar hot water heater effectively removes 50% of demand for electricity, thus halving the demand for coal-fired electrical power. A simple cost-benefit analysis will demonstrate the wisdom of such an investment, not least the new value chains and associated job creation in a labour intensive industry that would ensue. As many other countries now realise, the cost of hydrocarbons will inevitably rise over the next three decades while the cost of renewable energies will inevitable decline as the technologies improve[9].

Water and Sanitation[10]

With an average annual rainfall of 497mm South Africa is a dry country, and 98% of available water resources have already been allocated. This means that "South Africa simply has no more surplus water and all future economic development (and thus social wellbeing) will be constrained by this one fundamental fact that few have as yet grasped." (Turton 2008: 3). The country therefore has no further "dilution capacity" when it comes to absorbing effluents in its water bodies. The Johannesburg-Pretoria complex - South Africa's most significant urban-economic conurbation – is located on a high altitude watershed which means that outflows of waste water pollute the downstream water resources that Gauteng depends on for its water supplies. The result is that after China, South Africa's national water resources contain some of the highest toxin levels, in particular mycrocystin, for which no solution currently exists. Cyanobacteria blooms, caused by end-of-pipe NPK loads, threaten national water security. Inter-basin water transfers have degraded the ecological integrity of aquatic systems, and radionuclides, heavy metals and sulphates from mining activities have polluted valuable water resources. In short, the combination of low average rainfall, over-exploitation and re-engineered spatial flows have led South Africa to an imminent water crisis in quantity as well as quality.

[9] . For example, Concentrated Solar Power plants, which are already 60% efficient, can be connected to salt batteries that can store energy for 12 to 14 hours – this effectively means that solar power can contribute to the base load which has been the key obstacle to date.

[10] This section relies on the following documents: (Ashton & Turton 2008; Department of Water Affairs and Forestry 2006; Republic of South Africa. Deparment of Water Affairs and Forestry 2004; republic of South Africa. Department of Water Affairs and Forestry 2002; Turton 2008)

According to the Department of Water Affairs, in 2000 there was still surplus capacity of around 1.4%. Recent models indicate that very serious water shortages can be expected by as early as 2013. Significantly, it is the urban and domestic sector where consumption increases are set to triple:

Sector	m3/annum	
	1996	2030
Urban and domestic	2 171	6 936
Mining and industrial	1 598	3 380
Irrigation and afforestation	12 344	15 874
Environmental	3 932	4 225
Total	20 045	30 415

Figure 12 - historical consumption and projected water requirements for 2030 per sector

Figure 12 graphically represents the resource use crisis that will be generated by economic growth and poverty eradication if existing water management systems and processes remain unchanged.

There is scope for major water saving in two sectors – urban and domestic use, and the agricultural sector. Recycling urban waste water is an urgent priority. For example, between 40% – 50% of all water piped into households is used to flush toilets. Yet it is technically possible to flush toilets from on-site grey water flows (in particular for large middle class homes), or via neighbourhood-level closed loop systems that recycle water back to households. Rainwater harvesting and grey water supplies for irrigation also have potential. The second major water-saving priority is in agriculture, especially in combination with organic farming methods that simultaneously rebuild the biological capacity of soils and moisture retention capacity in the top layers.

The Government is aware of these severe water supply constraints. In her 2007 Budget Speech, the Minister of Water Affairs and Forestry dedicated considerable space to her water efficiency campaign, with apparent emphasis on regulations and

tighter controls. But unless more immediate and drastic action is taken, economic growth will soon be undermined by water shortages and related dysfunctionalities (like salinisation of aquifers etc). The research results are clear: available physical extra capacity in 2000 was at most 1.7% higher than existing requirements, while growth in water demand could be as much as 25% higher than available yield by 2025. Even if demand only increases by 1% per annum, by 2014 the economy will already be facing severe shortages on a number of fronts. By 2019, water shortages will have pulled the economy into a downward spiral of low growth and growing socio-economic inequalities, with associated mini-'resource wars' over water supplies.

Sophisticated modelling work by University of Pretoria researchers shows that a combination of physical, fiscal, institutional and technological interventions could turn this potential disaster into a major opportunity for effective sustainable resource use (Blignaut 2006). However, for this to occur, water resources need to be seen as a 'binding constraint', and Government must seriously invest in the sustainable resource use approach advocated by all leading researchers and policy managers in the water resource sector.

Solid Waste[11]

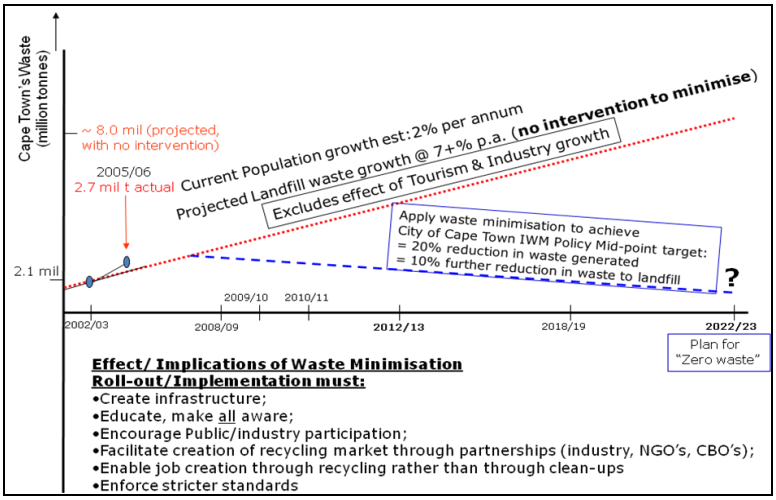
Solid waste includes all municipal and industrial waste. As of 2005, the solid waste system managed the disposal of 20 Mt[12] of municipal solid waste (MSW), 450 Mt of mining related wastes and 30 Mt of power station ashes. MSW quantities are growing faster than the economy in many cities[13]. The typical daily average of 2 kg/person is 3-4 times that in many European cities. Both the quantity and nature of solid waste differs considerably across the socio-economic spectrum. People in informal settlements generate on average 0,16kg per day, whereas over 2 kg per day is not unusual in affluent areas. Food and green waste makes up 35% of waste in affluent households, compared with 20% for poor households. In Cape Town 60% of industrial waste is recycled, compared to only 6.5% of residential and commercial

[11] Based on (Von Blottnitz 2005).

[12] Mt =1 million metric tonnes or 1 billion kg.

[13] For example, in Cape Town MSW is growing by 7% per annum.

waste (among the lowest in the world). There is no reason to believe that the situation is much different in other South African cities.



(Source: City of Cape Town 2007)

Figure 13 - Past and projected consumption of transportation fuels (million litres/ year)

While many countries have moved away from 'disposal-to-landfill' as the primary means of solid waste management, in South Africa the large bulk of MSW is disposed of in landfill sites spread out across the country. Although national costs have not been calculated, they are probably similar to those in Cape Town where the cost of managing landfills – and related dumping – doubled between 2000 and 2004. Growth in the minerals and coal-based energy sector directly leads to increased industrial wastes with limited productive recycling and re-use – a clear example of the way unsustainable resource use is coupled to growth and poverty reduction. Yet technologies and processes for decoupling waste from growth and poverty eradication are simple, low cost and extensively used throughout the world.

Waste recycling represents one of the most immediate, tangible and low-cost investments in dematerialisation available. It saves on capital costs, creates jobs, and forces the middle classes to take greater responsibility for the resources they throw away. It is also normally a highly competitive sector, with sophisticated value chains with respect to resources like used engine oil, used vegetable oils, a wide range of

plastics, building rubble, organic matter for composting, glass, cans, paper, etc. Numerous studies confirm that recycling has very positive economic benefits with respect to job creation, manufacturing and technology and innovation. Furthermore, waste recycling also has significant export potential.

The National Integrated Waste Management Act adopted by Parliament in 2009 will force every Local Government to prepare an Integrated Waste Management Plan with defined targets for recycling, thus paving the way for a recycling revolution in South African cities. The stage is now set to move South Africa decisively into a post-disposal approach with respect to MSW, with a special focus on middle and high income consumers. The Mineral and Petroleum Resources Development Act (2002) makes specific provision for waste management and pollution control in the mining sector. This Act, together with the emerging MSW approach, provides the basis for the emergence of a vast decentralised network of market-driven and community-based recycling businesses. In addition the National Cleaner Production Strategy is being beefed up, establishing incentives and legal requirements to stimulate cleaner production systems (CPS) in the business sector – particularly mining and construction – with a special focus on investments in recycling enterprises.

Soils[14]

South Africa falls within the so-called 'third major soil region' typical in mid-latitudes on both sides of the equator. The result is that South Africa is dominated by very shallow sandy soils with severe inherent limitations for agriculture. Only 13% of the land is arable and just 3% high potential land. The result is overexploitation and the use of inappropriate farming methods, as we try to exceed our soils' capacity to meet growing food requirements. All this has resulted in far-reaching nationwide soil degradation.

Water erosion remains the biggest problem, causing the loss of an estimated 25% of the nation's topsoil in the past century and continuing still. Other factors include: wind erosion affecting 25% of soils; soil compaction due to intensive mechanised agriculture; soil crusting caused by overhead irrigation systems; acidification of more

[14] Based on Laker 2005.

than 5 million hectares of arable land, caused by poor farming practices particularly incorrect fertilizer and inadequate lime applications; soil fertility degradation resulting from annual net losses of the three main plant nutrients (Nitrogen, Phosphorous and Potassium); soil pollution caused by various human practices; urbanisation often spreading across high value arable land on the outskirts of cities.

Once land is degraded, there is little potential for recovery. Areas where degradation is limited must be prioritised so that efforts can be focussed on prevention via appropriate farming practices. Reversing the above trends will require locally trained soil scientists who recognise that our soil conditions are unique (because they are 'third major soil region' soils) and therefore we cannot copy solutions generated in countries with a different soil profile. Location specific technical solutions are required as blanket solutions have proven unworkable. Locally trained soil scientists must work together with local leader farmers via horizontal learning practices. This has worked in India, Cuba and many other places in the developing world and is urgently required in South Africa.

Biodiversity[15]

South Africa is globally recognised as the third most biologically diverse country in the world, yet this diversity is one of the most threatened on the planet. Significantly, this concerns not just the prevalence of plant and animal species, but also critical ecosystems that provide vital services to human society.

	Officially classified as threatened	**Main issues and causes**
Terrestrial ecosystems	34%	▪ degradation of habitat ▪ invasion by alien species
Freshwater ecosystems ▪ *Wetlands destroyed* ▪ *Fish threatened*	82% *50%* *36%*	▪ pollution ▪ over-abstraction of water ▪ poor water course condition

[15] Based on Driver et al. 2005.

Marine ecosystems ▪ *Estuaries endangered*	65% *62%*	▪ climate change ▪ unsustainable marine harvesting ▪ seabed destruction by trawling ▪ coastline urbanisation ▪ marine pollution

Table 14 - Key threats to South Africa's ecosystems

Although South Africa has invested enormous public, private and community resources into expansion of protected areas, conservation areas and reserves, in future innovative partnerships will be required to ensure that the burden for all this is not carried entirely by the fiscus. To this end the Protected Areas Act offers a unique opportunity. It provides for any land, including private or communal, to be declared a formal protected area, co-managed by the landowner(s) or any suitable person or organisation. This means that formal protected area status is not limited to state-owned land, and that government agencies are not the only organisations that can manage protected areas, opening the way for a range of innovative arrangements not previously possible. A related challenge is to make the links between protected area development, sustainable tourism, and benefits to surrounding communities who should be key stakeholders in protected areas.

The National Environmental Management Act provides for a comprehensive regulatory framework for protecting key environmental resources. The core instrument used to give effect to this Act is the Environmental Impact Assessment (EIA). Although development projects must be subjected to an EIA, the focus is on costs of pollution and environmental impacts, and not resource inputs and prices. This does not provide a sufficient basis for decoupling over the long run.

Policy Responses

Recent years have witnessed an emerging trend in South Africa's national policy discourse calling for more responsible use of natural resources. Growing numbers of policy statements acknowledge that the country's economic growth and development path is too resource intensive and that this needs to change. However, this way of

thinking is by no means a dominant paradigm in policy-making circles. Section 24(b) of South Africa's new Constitution commits the state to "secure ecologically sustainable development and use of natural resources while promoting justifiable economic and social development." This provides the point of departure for the National Framework for Sustainable Development (NFSD) adopted in June 2008 (Republic of South Africa. Department of Environmental Affairs and Tourism 2007).

During the course of 2009 the Cabinet mandated the Department of Environmental Affairs to transform this policy framework into a more binding 'strategy', hence the commencement of the complex process of formulating the *National Strategy for Sustainable Development.* However, key macroeconomic policy documents make no reference to Section 24(b) of the Constitution, the LTMS and the NFSD.

Macroeconomic Policy versus Section 24(b) of the Constitution

In line with an ideological shift since 2002 away from neo-liberalism towards a more 'developmental state' approach, the Accelerated and Shared Growth Initiative for South Africa (ASGI-SA) was adopted in 2006 as the official economic policy framework . Its focus is on specific 'binding constraints' that must be dealt with via concerted state-coordinated interventions that run contrary to traditional neo-liberal prescriptions. ASGI-SA lists the following binding constraints: currency volatility; cost, efficiency and capacity of the logistics and transport system; shortage of skilled labour; barriers to entry and limits to competition; regulatory environment; and state capacity.

In 2007, Cabinet adopted the National Industrial Policy Framework (NIPF) (Republic of South Africa. Department of Trade and Industry 2007). The NIPF lists four preconditions for effective industrialisation via industrial sector interventions:

- stable and supportive macroeconomic environment
- adequate skilled labour supply supported by appropriate education infrastructure
- existence of traditional and modern infrastructure[16]

[16] Traditional infrastructure includes transport, electricity, water, while modern infrastructure refers to wireless, satellite, broadband, fixed line and mobile telecommunication networks.

- innovation capabilities to foster development of domestic technologies and systems.

Neither ASGI-SA nor NIPF make any reference to Section 24(b) of the Constitution. Natural resources and ecosystem services are not identified as 'binding constraints' suggesting that no action is required to prevent further degradation. A viable set of eco-systems and long-term supply of natural resources are not regarded as preconditions for successful industrialisation. The implicit assumption appears to be that natural systems, within which the socio-economic system is embedded, are intact and durable. In short, contrary to all the scientific evidence, the natural resource base is taken for granted.

National Framework for Sustainable Development (NFSD)

The NFSD was adopted by Cabinet in June 2008. In sharp contrast to macroeconomic policy, it explicitly acknowledges the growing stress on environmental systems and natural resources from economic growth and development strategies, and maps out a vision and five "pathways" to a more sustainable future:

- enhancing systems for integrated planning and implementation
- sustaining our ecosystems and using resources sustainably
- investing in sustainable economic development and infrastructure
- creating sustainable human settlements
- responding appropriately to emerging human development, economic and environmental challenges.

The NFSD commits South Africa to a long-term programme of resource and impact decoupling. The Government has resolved that the NFSD will be converted into a full-blown National *Strategy* for Sustainable Development by the end of 2010 that will include specific targets, commitments and budget allocations under the above headings.

Ad Hoc Policy Shifts

Because resource constraints and negative environmental impacts are material realities, they show in all sorts of unanticipated ways. Although some of these unanticipated consequences are reflected in prices that, in turn, loop back into production costs and consumption prices, others are deeper and more long-term with consequences that get reflected in less material things like quality of life, the wealth of future generations and unemployment. What is interesting is that there are a wide range of policy shifts over the last few years that reveal that government and stakeholders are responding in *ad hoc* ways to these underlying resource constraints and environmental impacts. Examples include the following:

- the passing of the National Integrated Waste Management Act in 2009 that provided for the introduction for the first time of the globally recognised "3R" framework – reduce, recycle and re-use;
- the National Environmental Management Air Quality Act of 2004 was a response, albeit lacking in several respects, to the declining quality of the air that we breathe, in particular in urban areas, resulting in rising health costs to treat respiratory diseases;
- the introduction by the Department of Agriculture of a "land care" programme aimed at finding ways of rehabilitating the quality of our soils, even though virtually no funds are allocated for this task – contrast this to Cuba and China, with the former making soil rehabilitation via organic farming methods a top security priority after the fall of the Soviet Union in 1990, and the latter deciding to incentivise organic farming methods as a key element of its rural development programme that targets the 600 million rural Chinese who produce the bulk of China's food. Unfortunately, South Africa's 2009 Rural Development Strategy (a cornerstone of the Zuma Government's political strategy) makes no mention of the need to rehabilitate South Africa's soils even though it assumes millions will make a living cultivating these soils;
- the National Water Resource Strategy has been a focus of the Department of Water Affairs for a number of years, but a greater sense of crisis is evident in the work that is going into the Water for Growth and Development strategy which acknowledges that South Africa has a limited water supply that will negatively

affect future growth and development strategies. However, practical implementation to radically change water management systems at municipal level has yet to materialise and there is doubt that DWA has the capacity to implement a sustainable water resource strategy;

- the introduction of the Renewable Energy Feed-In tariff that makes it possible for investors to establish renewable energy plants that will feed energy into the national grid in return for payments from ESKOM. This follows global trends, but ESKOM sneakily included a regulation that only it can buy this power. This means nothing will happen because ESKOM has made it clear that it does not intend concluding contracts to do this in the near future. Furthermore, it has decided to halt its own investments in renewable energy, and will consider building a Concentrated Solar Power plant only because the World Bank insisted on this as a condition for its loan for building a coal-fired power station;
- the introduction by the National Department of Human Settlements of a national programme to introduce sustainable resource use criteria into the design of the settlement projects and houses that it subsidizes across the country, with special reference to things like densities, orientation of the buildings, roof overhangs and insulation, installation of solar hot water heaters, and sustainable use of water and waste resources;
- the inclusion of carbon taxes in the 2007 and 2008 budgets. This was smart because the transition to a low-carbon economy can best be achieveD via a slow and gradual decrease in the carbon intensity of the economy via taxes and incentives that increase the price of carbon in ways that can capture the revenues generated for re-investment in low-carbon technologies;
- the adoption by the Department of Science and Technology of the Global Change Grand Challenge policy framework which provides for a ten year investment in the kind of science that will develop for South Africa the skills sets and knowledge base for designing and implementing more sustainable production and consumption systems;
- that big shift within the transport sector in favour of large-scale investments in public transportation systems that will, hopefully, gradually lead to much more aggressive measures to retard the growth of private car consumption and use;
- the adoption by Cabinet in 2008 of the LTMS and the NFSD already mentioned;

- the significant moves emanating from the Cabinet's Economic Cluster to formulate a 'green economy' approach, including the Green Jobs and Industries for South Africa initiative (known as "Green-JISA");
- Section 12.2 of the much praised Industrial Policy Action Plan released in February 2010 by the Minister of Trade and Industry refers specifically to the need for "green and energy-saving industries" because rising energy costs "render our historical capital and energy-intensive resource processing based industrial path unviable in the future".
- the National Treasury has promised to release its Carbon Tax Discussion Document in mid-2010;
- the slow and painful process of formulating and adopting a National Climate Change Policy Framework, largely driven by the need to position South Africa globally as a player in the global climate negotiations leading up to the Copenhagen Conference in December 2009 – the National Climate Change Response Strategy is promised for "mid-2010";
- the Department of Energy has agreed to commence the process of revision the Integrated Resources Plan in April 2010, and in late 2009 it appointed consultants to write the long awaited Renewable Energy White Paper;
- the Department of Energy released in December 2009 the Solar Hot Water Framework that promises to ensure the delivery of 1 million solar hot water heaters;
- as far as our key eco-system services are concerned, significant progress has been made, including the passing of the National Environmental Management Biodiversity Act (NEMBA), the National Environmental Management Protected Areas Act (NEMPAA) in 2004, and the National Environmental Management Integrated Coastal Management Act in early 2009;
- connections between sustainable resource use and livelihood creation are recognised in programmes such as Working for Water, Working for Wetlands, LandCare, Coast Care and the Integrated Sustainable Rural Development programmes.

All these initiatives can be traced in one way or another to resource constraints and the negative implications for both growth and development. Unfortunately, macro-

economists and industrial strategists are not reading the clear signals that these *ad hoc* responses represent. This strategic blind spot is rooted in the dualistic nature of our science, which equips development economists with no knowledge of natural resources and eco-systems. As a result the responses are *ad hoc* in nature, rather than part of structural change in recognition of global and local resource constraints. Hopefully the National Strategy for Sustainable Development that is set for adoption by Cabinet in 2010 will integrate these emerging trends into an overarching long-term development vision for South Africa. But unless the National Planning Commission is mandated to drive the NSSD, the NSSD will fail to provide a framework for integration that helps South Africa catch up with many leading developed and developing nations that have realised that sustainable resource use holds the key to innovation-led growth and development.

Growing Influence of Sustainability Thinking

In July 2008, the South African Cabinet endorsed the outcomes of the Long Term Mitigation Scenario (LTMS) process, which explored options for climate change mitigation in a multi-stakeholder exercise. Reinforcing the NFSD, the LMTS recommended the 'Required by Science Scenario' that envisages 30% - 40% reduction in South Africa's emissions by 2050. In April 2006 the National Treasury published for comment a remarkable document entitled *A Framework for Considering Market-Based Instruments to Support Environmental Fiscal Reform in South Africa.* The document defines an environmental tax as a "*tax on an environmentally-harmful tax base"* (Republic of South Africa. National Treasury 2006ii (emphasis in original)) and examines all existing environmental taxes, charges and levies[17], which combined account for approximately 2% of GDP and just under 10% of total tax revenue. The report suggests that in light of the sustainable development challenge, tax shifting is required so that taxes levied on "bads" (such as pollution) can be increased and taxes on "goods" (such as labour) reduced. This, the report argued, is the "double-dividend hypothesis" – "minimising the burden of environmentally-related taxes on the

[17] Transport fuel levies (General Fuel Levy, Road Accident Fund Levy, Equalisation Fund Levy, Customs and Excise Levy); Vehicle Taxation (Ad Valorem Customs and Excise Duty, Road Licensing Fees); Aviation Taxes (Aviation Fuel Levy, Airport Charges, Air Passenger Departure Tax); Product Taxes (Plastic shopping bags levy); Electricity (NER Electricity Levy; Local Government Electricity Surplus); Water (Water Resource Management Charge, Water Resource Development and use of Water Works Charge, Water Research Fund Levy), and Waste Water (Waste Water Discharge Charge System - proposed).

affected sectors, whilst creating the required behavioural incentives to achieve certain environmental outcomes" (Republic of South Africa. National Treasury 2006v) . Put differently, taxes from unsustainable practices should increase, and be re-invested in more sustainable practices.

It is noteworthy that the National Treasury perspective described above is effectively a *command and control* perspective focussed on impacts. This is different to 'upstream' interventions that focus on primary resource inputs and prices. Nevertheless, this report, plus the gathering influence of the NFSD, did lead to the following statement by the Minister of Finance during his Budget Vote speech in 2008:

> We have an opportunity over the decade ahead to shift the structure of our economy towards greater energy efficiency, and more responsible use of our natural resources and relevant resource-based knowledge and expertise. Our economic growth over the next decade and beyond cannot be built on the same principles and technologies, the same energy systems and the same transport modes, that we are familiar with today.
>
> *(Minister of Finance, Parliament, 20 February, 2008).*

This is the clearest and most radical statement by a senior South African politician to date about the need for far-reaching measures to decouple rates of growth from rates of resource consumption. However, this way of thinking has been abandoned by the new Finance Minister in the Zuma Administration for reasons that were left unexplained. Nevertheless, other Ministers have responded to resource constraints in their respective sectors by emphasizing the need for sustainable resource use approaches. These include the Minister of Water Affairs and Forestry, who has admitted that by 2013 South Africa will face severe water shortages if alternatives are not implemented; the Minister of Energy, who has finally acknowledged that South Africa needs a rapidly expanding renewable energy sector[18]; and the Minister of Housing, who wants to see all low-income housing settlements subsidised by Government to include sustainable design elements such as correct orientation, insulation, public transport linked, recycling, energy efficient and supplied with

[18] A renewable Energy Feed-In Tariff was introduced in 2009, as well as a new Air Quality Management Act.

renewable energy. Significantly, the Minister of Science and Technology has called for a ten year science investment plan that will include a strong focus on innovations for sustainability, with decoupling referred to as a specific goal for innovation research and incentives. The Department of Environmental Affairs has completed the National Cleaner Production Strategy. This document lays down the framework through which different stakeholders (Government, Industry and Civil society) will participate in ensuring that South Africa achieves her goals on sustainable production and consumption (DEAT 2005b).

These policy shifts all reflect the fact that underlying resource constraints are forcing South Africa to adapt in an ad hoc manner, thus undermining the opportunities for innovation and new investment that they offer. While China, Europe, South Korea, Brazil, India and (even) the USA realize that resource depletion creates opportunities for innovation and investment, South Africa's economists seem to have disregarded Trevor Manuel's call to "shift the structure of our economy". Instead, the values and logic of the 'mineral-energy complex' remain hegemonic.

Decoupling – Opportunities for Action

Perhaps the most significant prospect for decoupling in South Africa is the massive injection of public and private investment funds to drive a vast multi-year infrastructure investment programme worth nearly R800 billion. A cornerstone of the government's long-term growth strategy, this national programme offers a unique opportunity to advance towards a more sustainable future. There is no doubt that public investment in infrastructure is a powerful way to ensure that growth sets up the conditions for meaningful poverty reduction. But there are two key questions.
The first is whether these investments address the challenges discussed above. There are some obvious positive investments, such as in public transport, upgrading of the rail infrastructure, and sustainable approaches to housing. These are already Government priorities. There are also some obvious gaps, e.g. investments in soil rehabilitation, sustainable water and sanitation, air quality and renewable energy on scale.

The second question is less about *what* is being built, but rather about *how* it will be built. There is an enormous opportunity to design and build low-carbon infrastructures and buildings that could contribute significantly to decoupling. Furthermore, the way infrastructures and buildings are developed on scale could be the single biggest catalyst we may ever have to drive a long-term commitment to sustainable resource use that, in turn, frees up resources for poverty eradication. Finally, doing things in new ways opens up a wide range of new value chains that could be exploited by new entrants into the sector with major employment creation opportunities. In its response to the global economic crisis, Government has accepted that "green collar jobs" will play a role.

Box 1 provides an overview of perfectly feasible and affordable strategic measures, following the priority headings used in the ASGI-SA policy document to prioritise investment focus areas:

Box 1 Decoupling Opportunities

Energy

- Increase Energy Efficiency by 20-30%: boost Demand-Side Management fund, remove it from ESKOM control, establish efficient decision-making system
- Increase Renewable Energy supply to 30% of national requirements from large-scale wind, solar, wave and biomass plants by Independent Power Producers using Feed-In Tariffs, and incorporate solar energy into all residential developments
- Promote solar roof tops: co-finance one million new houses with solar roof tiles and water heaters
- Create financial incentives and terminate disincentives via price-mechanisms for investment in energy efficiency innovations

Water and sanitation

- Switch from building dams to sustainable ground water exploitation and management (including storage and aquifer replenishment)
- Invest in reducing water loss from leakages to below 10%
- Reduce domestic water consumption by 40% via mandatory use of water efficient household fittings, grey water recycling and rainwater harvesting
- Build neighbourhood-level plants that recycle grey water for toilet flushing, capture methane gas for energy generation and capture nutrients for re-use in food production and greening
- Invest in technology innovations to reverse the qualitative degradation of national water resources

Transport and logistics

- Increase investments in urban public transportation systems, especially Bus-Rail-Transit (BRT)
- Shift long distance freight transport from road to rail
- Reduce dependence on oil via shift to electric cars, hydrogen and ecologically sustainable biofuels

Housing and social infrastructure

- Eliminate housing backlog via construction of 5 million low-income houses with sustainable design and close to centres of employment
- Increase densities from 15 – 20 dwelling units/hectare to a minimum of 35 – 45 dwelling units/hectare via smaller plot sizes, multi-story living, and neighbourhood designs that minimise private vehicle transportation
- Implement municipal 'green house' regulations governing all private, public and social infrastructure

LED infrastructure

- Substantial investment in institutional development for LED as envisioned in the LED Framework for South Africa (2006), but with a strong focus on payments for eco-system services, waste recycling and re-use, and investments in sustainability innovations (e.g. local manufacture and installation of solar energy systems).

Conclusion

The dominant economic paradigm in post-apartheid South Africa has to date failed to address a wide range of underlying resource constraints that will almost certainly undermine many preconditions for growth and development. The body of evidence that has emerged over the past decade at both the global level and within South Africa clearly demonstrates that there are very serious material resource and ecological limits to the type of growth and poverty eradication policies that are proposed by economic policy think-tanks like the Growth and Development Commission (that the Minister of Finance so admires). With significant exceptions, growth models have not emphasized the need for decoupling growth rates from rates of resource consumption and associated declining quality of the environmental systems that we depend on for things like clean air, productive soils, and clean water. Reversing this trend will require policy frameworks and interventions that are currently absent from national economic policy documents but which are slowly starting to emerge, with 2010 clearly set to be a watershed year. However, it is one thing to formulate policy, it is a very different matter when it comes to implementation through inter-institutional coordination, budget reform and regulatory interventions. Like many other policy realms, the South African state's capacity to formulate policies is not matched by its capacity to implement these policies.

There is broad consensus around two economic and social challenges for South Africa's second decade of democracy:

- how to boost growth to 6% and ensure a more equitable distribution of wealth;
- how to eradicate poverty, with special reference to the Millennium Development Goals.

The sustainability perspective means there now is a third challenge, and due to the adoption of the NFSD and LTMS, this is being recognised:

- how to decouple growth rates and poverty eradication from rising levels of natural resource use and waste.

Many of South Africa's leading scientists have for some time been saying that economic growth policies are premised on incorrect assumptions about the health and durability of our natural resources and eco-system services. Aligning economic policy with Section 24 (b) of the Constitution is not simply about preserving the environment. As other countries have experienced, it is also about preventing wasteful expenditures on avoidable system failures. But above all, it can also be about the creation of new opportunities for driving non-material forms of growth that improve quality of life for all, forever.

REFERENCES

Ashton, P.J. & Turton, A.R. 2008. Water and Security in Sub-Saharan Africa: Emerging Concepts and their Implications for Effective Water Resource Management in the Southern African Region. In: H. G. Brauch, J. Grin, C. Mesjasz, H. Krummenacher, N. C. Behera, B. Chourou, U. O. Spring, P. H. Liotta and P. Kameri-Mbote. (Ed.). *Facing Global Environmental Change: Environmental, Human, Energy, Food, Health and Water Security Concepts - Volume IV*. Berlin: Springer-Verlag.

Barbier, E.B. 2009. *A Global Green New Deal*: Report prepared for the Economics and Trade Branch, Division of Technology, Industry and Economics, United Nations Environment Programme.

Behrens, A., Giljum, S., Kovanda, J. & Niza, S. 2007. The Material Basis of the Global Economy: Worldwide Patterns of Natural Resource Extraction and their Implications for Sustainable Resource use Policies. *Ecological Economics.* 64:444-453.

Blignaut, J. 2006. *Macro-Perspectives on Water Supply and Demand: Implications of the 6% Economic Growth Rate.* Presentation to National Environmental Advisory Forum: Pretoria. October 3.

Bringezu, S. & Bleischwitz, R. 2009. *Sustainable Resource Management: Global Trends, Visions and Policies*. Germany: Wuppertal Institute.

Bringezu, S. & Schutz, H. 2001. *Material use Indicators for the European Union, 1980-1997. Economy-Wide Material Flow Accounts and Balances and Derived Indicators of Resource use*. Luxembourg: Eurostat.

Bringezu, S., Schutz, H., Steger, S. & Baudisch, J. 2004. International Comparison of Resource use and its Relation to Economic Growth: The Development of Total Material Requirement, Direct Material Inputs and Hidden Flows and the Structure of TMR. *Ecological Economics.* 51(1/2):97-124.

Burns, M. & Weaver, A. 2008. *Exploring Sustainability Science: A Southern African Perspective*. Stellenbosch: Sun Press.

Cairncross, E.K. 2005. *Air Quality*. Cape Town: Unpublished paper commissioned by the Department of Environmental Affairs and Tourism.

City of Cape Town 2007. *Report to the Chairperson: Utility Services Portfolio Committee Solid Waste Management. Department Sector Plan for Integrated Waste Management and Service Delivery in Cape Town.* Cape Town: City of Cape Town, unpublilshed document.

Commission on Growth and Development 2008. *The Growth Report: Strategies for Sustained Growth and Inclusive Development*. Washington, D.C.: World Bank.

Department of Water Affairs and Forestry 2006. *South Africa's Water Sources*: 2006. Pretoria.

Fine, B. & Rustomjee, Z. 1996. *The Political Economy of South Africa: From Minerals-Energy Complex to Industrialization.* Boulder, Co.: Westview Press.

Fischer-Kowalski, M. 1999. Society's Metabolism: The Intellectual History of Materials Flow Analysis, Part II, 1970-1998. *Journal of Industrial Ecology.* 2(4):107-136.

------- 1998. Society's Metabolism: The Intellectual History of Materials Flow Analysis, Part I, 1860-1970. *Journal of Industrial Ecology.* 2(1):61-78.

Gallopin, G. 2003. *A Systems Approach to Sustainability and Sustainable Development*: Project NET/00/063. Santiago: Economic Commission for Latin America.

Gleick, P. 2006. *The World's Water (2006-2007): The Biennial Report on Freshwater Resources*. Washington, D.C.: Island Press.

Haberl, H., Fischer-Kowalski, M., Krausman, F., Weisz, H. & Winiwarter, V. 2004. Progress Towards Sustainability? what the Conceptual Framework of Material and Energy Flow Accounting (MEFA) can Offer. *Land use Policy.* 21:199-213.

Intergovernmental Panel on Climate Change 2007. *Climate Change 2007*. Geneva: United Nations Environment Programme.

International Energy Agency 2008. *World Energy Outlook*. Paris: International Energy Agency.

Keqiang, L. 2009. Keynote Speech to the Annual General Meeting of the China Council for International Cooperation on Environment and Development. Beijing, 11-13 November 2009.

Krausman, F., Eisenmenger, N., Braunsteiner-Berger, J., Deju, M., Huber, V., Kohl, L., Musel, A., Nussbaum, M.L., Rechnitzer, S. & Reisinger, H. 2005. *MFA for South Africa*. Vienna: Institute for Social Ecology.

Krausman, F., Schandl, H., Fischer-Kowalski, M. & Eisenmenger, N. 2008. The Global Socio-Metabolic Transition: Past and Present Metabolic Profiles and their Future Trajectoris. *Journal of Industrial Ecology.* 12:637-656.

Krausmann, F., Gingrich, S., Eisenmenger, K.H., Haberl, H. & Fischer-Kowalski, M. forthcoming. Growth in Global Materials use, GDP and Population during the 20th Century. *Ecological Economics.* 68(10): 2696-2705.

Mohamed, S. 2008. *Financialization and Accumulation in South Africa*. Unpublished Powerpoint presentation, 7 April 2008. Johannesburg: Corporate Strategy and Industrial Development, University of the Witwatersrand.

Morin, E. 1999. *Homeland Earth.* Cresskill, NJ: Hampton Press.

Republic of South Africa. Deparment of Water Affairs and Forestry 2004. *National Water Resource Strategy*. Pretoria: Department of Water Affairs and Forestry.

Republic of South Africa. Department of Environmental Affairs and Tourism 2007. People Planet Prosperity. A Framework for Sustainable Development in South Africa. [Online: retrieved 24 February 2008]. Department of Environmental Affairs and Tourism: Pretoria: 24 February 2008. Available from: www.sustainabilityinstitute.net.

Republic of South Africa. Department of Trade and Industry 2007. *A National Industrial Policy Framework*. Pretoria: Department of Trade and Industry.

Republic of South Africa. Department of Water Affairs and Forestry 2002. *The Development of a Sanitation Policy and Practice for South Africa*. Pretoria: Department of Water Affairs and Forestry.

Republic of South Africa. National Treasury 2006. *A Framework for Considering Market-Based Instruments to Support Environmental Fiscal Reform in South Africa*. Pretoria: Government Printer.

Republic of South Africa: National Treasury 2006. *Accelerating Economic Growth - A Diagnostic Scan*. Unpublished Power Point Presentation. Pretoria: National Treasury.

Stern, N. 2007. *Stern Review: Economics of Climate Change*. Cambridge: Cambridge University Press.

Stiglitz, J., Sen, A. & Fitoussi, J.P. 2009. *Report by the Commission on the Measurment of Economic Performance and Social Progress*. Report Commissioned by President Sarkozy, French Government.

Swilling, M., van Weiszaecker, E., Fischer-Kowalski, M., Manalang, A., Yong, R., Moriguchi, Y. & Crane, W. 2009. *Decoupling and Sustainable Resource*

Management: A Review - Draft 1.6. Paris: International Panel for Sustainable Resource Management, United Nations Environment Programme.

Turton, A.R. 2008. *Three Strategic Water Quality Challenges that Decision-Makers Need to Know about and how the CSIR should Respond: Keynote Address.* Science Real and Relevant: Pretoria. Centre for Scientific and Industrial Research. 18 November 2008. Pretoria.

United Nations 2006. *State of the World's Cities 2006/7*. London: Earthscan & UN Habitat.

------- 2005. *Millenium Ecosystem Assessment*. New York: United Nations.

United Nations Development Programme 1998. Human Development Report 1998. [Online: retrieved October/22/2006]. United Nations Development Programme: New York: 5 November 2006. Available from: http://hdr.undp.org/reports/global/1998/en/.

United Nations Environment Programme 2007. *Global Environment Outlook GEO 4: Environment for Development*. Nairobi: United Nations Environment Programme.

Von Blottnitz, H. 2005. *Solid Waste*. Cape Town: Unpublished paper commissioned by the Department of Environmental Affairs and Tourism.

Wakeford, J. 2007. *Peak Oil and South Africa: Impacts and Mitigation*. Cape Town: Association for the Study of Peak Oil and Gas - South Africa.

Watson, R.T., Wakhungu, J. & Herren, H.R. 2008. *International Assessment of Agricultural Science and Technology for Development (IAASTD).*

World Bank 2005. *Where is the Wealth of Nations? Measuring Capital for the Twenty-First Century*. Washington, D.C.: World Bank.

World Resources Institute 2002. *Decisions for the Earth: Balance, Voice and Power*. Washington D.C.: World Resources Institute.

World Wildlife Fund 2008. *Living Planet Report 2008*. Gland, Switzerland: World Wildlife Fund.