
**Summary notes from the Goedgedacht Forum for Social Reflection debate of
8 April 2006: 'Climate change'**

Speakers:

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Dr Bob Scoles	Systems Ecologist: Council for Scientific and Industrial Research (CSIR); Intergovernmental Panel on Climate Change
Linda Manyuchi	Deputy-Director: Resource-Based Industries, Department of Science and Technology

Facilitator:

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Other participants:

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Staff and observers

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Abstract

Dr Bob Scholes of the Council for Scientific and Industrial Research and a member of the Intergovernmental Panel on Climate Change provided a brief introduction to the topic. Global climate change is irreversible, even if it were possible for the world to stop harmful carbon emissions immediately. The world is getting warmer overall, there will be a rise in sea levels and there may be an increase in extreme weather events. Vector- and water-borne diseases are likely to

increase. Parts of the world will become warmer and wetter, but southern Africa will become hotter and drier, leading to increased food insecurity for about 18 million people in the region. International agreements attempt to avoid dangerous levels of change but mitigating climate change requires all countries to reduce emissions, even those who had historically contributed less to the problem. Avoiding serious consequences require reducing global emissions by 95%, but the Kyoto Protocol proposes reductions of only 5%. Linda Manyuchi of the Department of Science and Technology spoke about the need to balance the need for economic development with the need to mitigate climate change. Prof Patrick Bond of the Centre for Civil Society at the University of KwaZulu-Natal said access to energy was becoming less and less equitable in South Africa – industry benefited from the cheapest electricity in the world, but the poor did not receive the benefit; in fact the supply to many thousands of poor consumers had been cut off. Cross-subsidisation should ensure cheap electricity for the poor, and reduce dependence on natural resources such as trees for energy. Government regulation of emissions had to be tightened up and measures to reduce waste had to be introduced. Economic development strategies, currently energy-consumptive and capital-intensive, would have to be fundamentally rethought. South Africa was one of the world's worst emitters of greenhouse gases, but it has failed to invest in renewable sources of energy. Rather than engaging with international carbon trading (something he described as a fraud), government should facilitate grassroots carbon reduction initiatives. The discussion then went into various other elements of what can be done to adapt to climate change, and what can be done to mitigate its severity.

Global warming and the privatised atmosphere

Patrick Bond

Declining global oil reserves

The North has used up most of the oil that nature has provided. There has been a net depletion of oil reserves – since 1979, the world has consumed more oil than it has been able to find. Newly discovered reserves are less than the oil that has been consumed already, and drilling new exploration wells is not helping. When can we expect to run out of oil? The discovery peak was 1965, the production peak was in 2005 – a 40-year lag. This suggests we only have 40 years of oil left. The only times that consumption has not steadily increased were during the oil crises of 1973 and 1979 when high prices curbed demand.¹

Defining the problem

South Africa has eight energy policy problems:

- worsening access to clean energy by class, gender, race and geography
- pressures to simultaneously commercialise and partially privatise Eskom and the proposed regional electricity distributors
- economic development strategies that remain energy-consumptive and capital-intensive
- one of the world's worst contributions to global warming, measured by carbon dioxide (CO²) per capita per GDP [Gross Domestic Product] unit
- participating in a recently-launched, highly controversial World Bank carbon trading pilot scheme – the Prototype Carbon Fund
- the prospect of intensified reliance upon nuclear-powered electricity generation

¹ Source for this paragraph: Research by former oil exploration geologist Dr Colin Campbell published on www.energycrisis.org.

- untapped potential in renewable energy, especially through solar and wind sources
- excessive influence over energy and development strategies across southern and central Africa.

In addition:

- South Africa contributes 1.8% of total greenhouse gases, making it one of the top contributing countries in the world
- the energy sector is responsible for 87% of CO², 96% of sulphur dioxide (SO²) and 94% of nitrous oxide emissions
- because the domestic economy is powered by coal, South Africa has experienced a five-fold increase in CO² emissions since 1950
- South Africa accounts for 41.9% of Africa's CO² emissions, followed by Egypt (14.1%), Nigeria (10%), Algeria (9.9%) and Libya (4.8%).²

Electricity and the poor

In the 1980s, the government took a policy decision to have more power stations than South Africa needed at that time so that the country could offer investors the cheapest electricity in the world. Eskom built so many power stations in the 1980s and early 1990s that we had 25–30% excess electricity capacity, but this was not accompanied by a meaningful expansion of the electricity grid for ordinary people. The fact that most electricity is generated from poor-quality coal has meant that South Africa is one of the world's worst polluters. Its CO² emission per unit output per person in 1999 was 20 times worse than that of the US.

There is inequality in the cheapness of electricity. Electricity is cheap for industry, but expensive for poor people. Energy apartheid in South Africa has been one of the most durable forms in which the inequality of the past has been preserved:

- in rural areas, approximately three million households burn fuelwood for their energy needs, causing deforestation, a reduction of CO² sinks,³ and indoor health problems
- the industrial sector consumes 2.6 quads of energy (57% of total primary energy consumption) and emits 66.8 MT of carbon (65% of total carbon emissions from fossil fuels), though industry's contribution to GDP is 29%
- since 1970, South Africa consistently has consumed the most energy and emitted the most carbon per dollar of GDP among major countries. South African energy-intensity measured 33.5 K BTU per \$ unit, nearly China's level.⁴

The government 'talks Left':

ANC-led local government will provide all residents with a free basic amount of water, electricity and other municipal services, so as to help the poor. Those who use more than the basic amounts will pay for the extra they use. (ANC campaign promise, 2000 municipal elections).

At the same time, it does not create disincentives for consumers who use large amounts by having a higher marginal price, but this is not the case. There is no real incentive for conserving electricity.

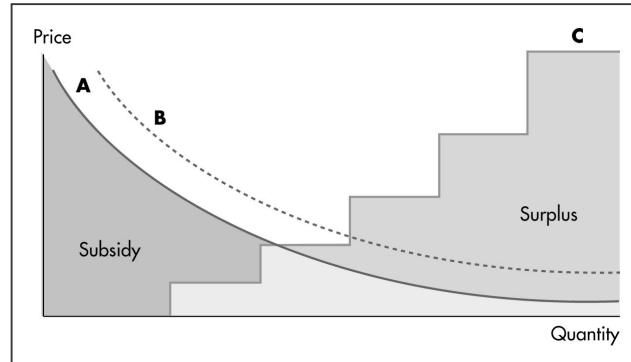
² Source: Research by Mark Jury.

³ Plants absorb CO² and are therefore referred to as 'carbon sinks'.

⁴ Source: Mark Jury.

How should we price electricity? Curve A in Figure 1 is cost-reflective. Curve B is privatised. Curve C is the ANC promise, but this is contradicted by the Department of Minerals and Energy's 1998 White Paper on Energy which insists on 'cost-reflective' tariffs:

Cross-subsidies should have minimal impact on the price of electricity to consumers in the productive sectors of the economy.



In spite of the election promise, we are seeing a disconnection epidemic:

- municipal electricity disconnections over typical three months: 296 325
- electricity reconnections done over typical three months: 152 291
- number of households receiving electricity: 3 366 226
- 17% of households disconnected in a year.⁵

The government's over-investment in energy generation made electricity artificially cheap, and has ensured support for a few huge economic projects like Coega that will consume huge amounts of electricity. The Coega strategy is high on carbon emissions and high on local pollution, but it will only yield a few hundred jobs, many of them temporary. Cost-benefit analysis and local efforts by green-red coalition to oppose Coega have been unsuccessful so far, and the government is hoping that a highly energy-intensive aluminium smelter will become the anchor tenant. An alternative development strategy has been suggested for Coega that addresses global warming and carbon emissions by using the land for solar salt reclamation, mining, farming, recreation and a Greater National Park.

Towards clean energy?

In December 2003, the Extractive Industries Review (EIR)⁶ recommended that the World Bank should phase out lending for oil and coal extraction and invest its scarce development resources in renewable energy by setting targets of increasing renewable energy lending by 20% a year. This was immediately rejected by the South African government in February 2004. Then-Minister of Minerals and Energy Phumzile Mlambo-Ngcuka told senior World Bank staff they should oppose 'green lobbyists' and promote the African Mining Partnership. She claimed that 'We are already implementing sustainable development programmes' but the reality is massive corruption and eco-

⁵ Source: Latest 'Project Viability' statistics (October–December 2001), Department of Provincial and Local Government.

⁶ An independent body established to make recommendations to the World Bank on its future role in extractive industries.

destruction in countries like Angola and Nigeria, and a failure to trickle down the benefits of mining in even the best-case country – Botswana.

Carbon trading

We have a depletion of natural resources. The question is not only ‘when do we run out of oil’, but ‘should we be using the remaining supplies?’ Should we reduce production, as the EIR suggests, or continue to produce and find a ‘safe’ carbon dump – the World Bank’s Prototype Carbon Fund (PCF)?⁷

Aubrey Meyer has a simple solution: ‘contraction and convergence’. This entails contracting the overall level of emissions while ensuring that equality in the amount of emissions per person is attained. But getting there requires trading for ‘safe’ carbon dumping. Dumping on the biosphere is dumping on the future, and it requires enclosing (or privatising) the land, the trees, the fresh water, the ocean space and the air. The carbon ‘sink’ solution – planting more timber plantations – does not work, because it drains the ground water.

Instead of closing the Bisaser rubbish dump in Durban because it is so close to where people live, the municipality has embarked on a sleazy US\$15 million PCF project to sell the methane from the dump. Will the PCF cause more public health damage through environmental racism? According to Sadija Khan, a resident of Clare Estate, which overlooks the dump:

To gain the ER credits they will keep this site open as long as possible. To them, how much money they get out of this is more important than what effect it has on our lives.

The Department of Environmental Affairs and Tourism sets out the government’s stance on the Clean Development Mechanism (CDM)⁸ as follows:

- South Africa, as a non-Annex I country, is not required to reduce its emissions of greenhouse gases. However, the South African economy is highly dependent on fossil fuels and the country can be judged to be a significant emitter due to the relatively high values that can be derived for emissions intensity and emissions per capita. Such calculations put South Africa as one of the world’s top 15 most energy-intensive economies, with a significant contribution to greenhouse emissions...
- It should be understood up-front that CDM primarily presents a range of commercial opportunities, both big and small. This could be a very important source of foreign direct investment.⁹

Critiques of the CDM include the following points:

- landfill gas is accorded a higher emission credit value
- CDM projects don’t benefit the local community, are concentrated in middle income countries and don’t contribute to sustainable development¹⁰
- there are problems associated with certifying ‘additionality’¹¹

⁷ The PCF provides for companies to ‘purchase’ potentially lower-cost emission reductions in developing countries and countries with economies in transition by providing finance for energy, industrial and waste management sectors, land rehabilitation, and in the introduction of clean and renewable technologies in those countries.

⁸ An instrument under the United Nations Framework Convention on Climate Change (UNFCCC).

⁹ Source: National Climate Change Response Strategy of September 2004.

¹⁰ Supporting sustainable development is a stated goal of the PCF.

¹¹ Article 12c of the Kyoto Protocol requires ‘additionality’ for emissions reduction credits, i.e. projects which want to qualify for credits have to do more than they would in the normal course of business to reduce emissions.

- there are non-substantive incentives for emissions reductions
- the scheme provides incentives for corrupt practices
- it relies on industry to report on its emissions figures
- the accuracy of emissions measurement is dubious
- the transport sector omitted
- it treats pollution-free air as a private commodity.

Conclusion

Instead of using non-solutions like carbon trading, we need:

- radically new industrial policies that are not energy-intensive
- tough regulation of emissions
- massive investment in renewable sources of energy
- a significant reduction in waste of energy
- grassroots carbon reduction initiatives such as insulating houses.

Climate change

Dr Bob Scholes, Council for Scientific and Industrial Research; Intergovernmental Panel on Climate Change

I would like to instil a sense of urgency about responding to climate change. People are good at responding to issues that are ‘urgent and important’, but poor at dealing with problems that are ‘important but distant’. It is difficult for South Africans to focus on something which may or may not happen some time in the future. This is due to the phenomenon of ‘time discounting’ – the idea that the future is less important than the present. But what we do in the present will definitely affect the future.

Climate is a complex system, and there is a time lag between the time that actions are taken and the time the consequences are manifested in the system. But once we cross certain thresholds, global climate change is irrevocable. There is clear evidence of a *directional change* in temperature globally and in South Africa. It is not a fluctuation, it is a directional change, although the change is not steady. About three-quarters of the warming problem can be attributed to human agency, the other 25% is a result of natural factors, including volcanoes, changes in solar radiation, and wobbles in the earth’s rotation around its axis. The directional signal in climate change is a human-induced signal. Historically the climate of the world has never been stable, but what we are going through now is a ‘no-analogue’ condition – there is no precedent for it in the human history of the world, and no exact analogue in the evolutionary past. Given the current rate of change and the causal variables at play, we cannot say we have been there before.

There is as yet no widely-accepted evidence for an observed change in precipitation in South Africa. Various rainfall changes are projected for southern Africa this century, mostly involving drying on the western side, and neutrality or wetting in the east. Uncertainty remains high.

The global climate system is a complex non-linear system. When you force such systems by, for example, a steady directional nudge as we have been doing, they do not behave in a smooth predictable way. Nothing changes until you get to a certain point, then everything changes. There can be massive changes in very short periods of time. When we came out of the last interglacial period, there were massive climate swings in as little as two years.

The United Nations Framework Convention on Climate Change (UNFCCC) sets out to avoid ‘dangerous levels of change’. But what constitutes a dangerous level? It is not just the *magnitude* of

change, but the *rate* at which you approach it. There is no reason to think we can't exist in a warmer world. This is not the end of life. It is an adaptation problem that is linked to how quickly things get warmer. There are already demonstrable impacts of climate change such as adaptation stresses on fauna and flora (for example, coral reefs), as well as the frequency and severity of tropical storms.

Another consequence of climate change is poorer *human health*. One element of this is direct temperature stress. We will eventually be 5°C or more warmer than at present. In places that are already hot, there is likely to be an increase in mortality among vulnerable people like the old and the very young. Higher temperatures will increase the range of disease vectors so we can expect an increase in water-borne diseases and diseases such as malaria.

The impact of climate change on *agriculture* is more complicated. It is not a foregone conclusion that a warmer world is bad for agriculture. We will have a warmer world, a wetter world and a more agriculturally productive world overall. However, southern Africa is the one place in the world that is projected to become drier and hotter, and that will impact negatively on the food security of 80 million people in the region. But southern Africa (excluding South Africa) is one of the few places left in the world where there is great room for agricultural expansion, greater than the projected loss due to climate change.

With regard to the impact on *water resources* in South Africa – if you were to divide South Africa by a north-south line into two halves, weather conditions west of the line are projected to become warmer and drier, while conditions east of the line may become warmer and wetter. Overall surface and groundwater resources are projected to decline, but these scenarios, and the simultaneous effects of rising carbon dioxide, are still uncertain.

On the question of *sea level rise* – the melting of the Greenland icecap is now inevitable. This will be devastating for low-lying countries in the long term (several centuries), but South Africa has a steep coastline, so it less vulnerable to rises in sea level. With a 0.5m rise in sea level, we can expect structural damage, but not major flooding. The Cape Flats is typically 15m above sea level. By contrast, the highest point in Walvis Bay is only 1.5m above the sea.

The level of *vulnerability* to climate change is a product of climate change impact and the level of coping capacity. Africa is the most vulnerable place to global change. Because its coping capacity is low, the impacts will be high.

The two responses to climate change are *mitigation* and *adaptation*. We must mitigate *and* adapt, it is not an either/or. Mitigation must be addressed in a way that is not necessarily fair. Everyone must contribute to mitigation efforts, saints and sinners alike, or everyone loses. There must be collective action on this issue. We will have to reduce emissions by 95% to avoid serious change, but the Kyoto Protocol provides for only a 5% reduction. There is an international focus on supporting adaptation to climate change, because people who don't adapt are reducing their own options for the future.

At this stage we are committed to climate change. At least five times the change we have already seen will still take place. We have passed the threshold for the melting of the Greenland ice cap, but we have not yet passed the threshold that will make all the Antarctic ice melt. Even if we were able to stop the anthropocentric forcing of climate change today, the actions that we take now have 'a tail' that goes hundreds of years into the future.

The climate system has a built-in inertia. Because of this time lag in the system, we have to take action *before* the changes take place, as I have said. The second type of inertia is *social inertia* – the problem of getting people to respond in time. The climate change debate started in the early 1980s, but it took a decade before the UNFCCC was signed at the Earth Summit in Rio de Janeiro in 1992. It took another decade for the Kyoto Protocol to enter into force in 2005. Will it take another decade to mobilise people? The third kind of inertia is *technical inertia*, for instance in energy systems and

processes, which take 30–50 years to replace. An energy generation facility takes 10 years to plan, and it has a working life of 40 years. The costs to society of rapidly changing to cleaner technologies before the old plant needs replacement are massive.

I have a different view of the Clean Development Mechanism (CDM) of the UNFCCC than some people. While I concede that such measures are inherently unfair, they are necessary. Politics is the art of the possible. We need to accept that globally we need to do mitigation where it is cheapest to do so. It might reward the guilty and offend us morally, but it is necessary to save our skins.

How should the South African government respond to climate change from a science and technology perspective

Linda Manyuchi, Department of Science and Technology (DST)

Government's response to climate change has to be informed by safeguarding the interests of its citizens, taking into account the disparities between the rich and the poor, through the medium of policy, strategy and law, and through co-ordinating activities. DST's role is to do research to answer the questions around climate change, with a view to addressing the best interests of citizens in the long term. The Department of Environment Affairs and Tourism co-ordinates the multi-stakeholder committee on climate change. DST is part of the national committee, the inter-departmental committee, and our minister is a member of the ministerial committee.

How do we participate in international processes in the interests of our citizens? We must balance the need for economic development with efforts to mitigate climate change. Reducing emissions will impact on industry, for example energy-intensive industries such as mining and metals production. We need to use international instruments like the Clean Development Mechanism to promote social development. In order to do that, we need to be able to negotiate from an informed position.

Excellent research has been done on climate change in South Africa in such fields as biodiversity (the South African National Biodiversity Institute), climate modelling (the Climate Systems Analysis Group at the University of Cape Town), management of water resources, and adaptation to climate change. Other potential areas for research include coupling the climate system with terrestrial and marine systems (including the human interface); monitoring and observation of climate change; modelling energy systems; mitigating impacts; working on adaptation strategies and calculating the costs of climate change (positive and negative). Capacity building should be built into all initiatives. We have good researchers, but there are too few.

Opportunities include using existing funding mechanisms, for example, the EU Framework Programme, and developing new technologies. Challenges include avoiding duplication with other initiatives, for example, adaptation. Climate change must be integrated with planning processes.

Debate points, thematically arranged

Expected changes in South Africa's climate

- The Climate Systems Analysis Group at UCT expects the north and east of South Africa to generally become warmer and wetter, and the south and west generally warmer and drier. Higher altitudes will be more affected by climate change than lower levels, and continental interiors will be more affected than coastal areas. South Africa' temperature will generally be warmer than the global average. It will be warmer in the drier sub-tropics and wetter in the tropics, with a corresponding impact on soil moisture. Winter rainfall is likely to decrease in much of the south-west.
- Even if all other weather factors – precipitation, wind, humidity etc. – stay the same, an increase in temperature will have a net drying effect. Any drying effect will be amplified in

the hydrological system. We know, for example, that a decrease of 5% in rainfall will result in a decrease of 15% in runoff.

- Extreme climate events are increasing in frequency and intensity, and many of them are unprecedented. We can expect more sudden heavy downpours and more serious droughts.
- Farmers in the Malmesbury area say it has been somewhat hotter, and there has been a reduction in runoff.

Expected impacts of climate change

- Climate change will cause changes in biodiversity, land use and land cover, water availability, flooding, droughts, sea level, human health (due to expanded thresholds for vector-borne and parasitic diseases including malaria, dengue fever and yellow fever) and heat stress. We can expect a decline in established economic activities (especially those linked to primary sector activities), a decline in labour productivity, and climate-related threats to livelihood assets. The resource base (ecological footprint) of urban areas will change in response to climate change. Resistance and adaptation to climate change can also be expected to impact on the shape of urban settlements.

Changing people's attitudes

- The people with the knowledge about climate change have not succeeded in conveying this to the broader population. A 1966 British television play called *Cathy Come Home* which highlighted the plight of the homeless created a change in the government's housing policy. Experts should sit with communications experts to find out the best way to get the message across to ordinary people, policy makers and politicians. Telling stories is a powerful way of getting a message across.
- Climate change is a highly complex subject. It is conceptually quite slippery, and the vectors of influence are not quite clear, so it is easy to point fingers and blame others. We need to nail it down to some manageable matter.
- Climate change is such a big and technically strange problem, people do not want to think about it. They cannot see how they can exert any individual effort to help.
- We are grappling here for a theory of social change, a theory of how 'we' adapt to new technologies, and a theory of how society as a whole changes. It needs to be appropriate to historical period. The theories of the past are not likely to be applicable.
- Einstein said that everything should be as simple as possible, but no simpler. In our quest to be accessible, we must make the messages simpler, but they are not easy, and we run the risk of over-simplifying.
- We need to crystallise a set of reliable simplifications, not a list that is politically convenient, or one which glosses over the real issues, but a list which is true enough for people and organisations to put into practice.
- It is important for arguments to not be based on philosophical or moral or ethical approaches, there must be an economic base to an argument for changing behaviour.
- We need to prepare people for climate change, proactively trying to anticipate the likely impacts. Climate change will definitely impact on people, but the change is not likely to be cataclysmic, so it is remote from people, it is hard for them to see and relate to. We need to inform the public about who will gain, who will lose, and in what way. The impacts will not be monolithic or uniform. Vulnerable people, small farmers, large farmers, agribusiness, all sectors will need to anticipate what will happen and take action to mitigate and adapt. If we

wait for the tipping point, we will only be able to react. Capping of emissions is not going to happen, there are too many vested interests. We need to act locally and think globally.

- The largest emissions are coming from transnational energy corporations. We must seek to influence things at that scale, as well as encourage local energy projects which reduce the need to build coal power stations. It is not an either/or; it is both/and. Decisions made now about energy infrastructure will technologically lock us in for decades to come.

Getting past being overwhelmed by the challenge

- We need an empowering statement about simplicity, thinking and doing in a realm of complexity in which no single action is likely to be right. We are in a completely new situation regarding social change and our tools and way of thinking about social change must therefore also be new. We are dealing in 'glue' most of the time. The idea of sustainable development [including mitigating climate change] is asking people to look into an abyss that, if we are not careful, we will fall into. What that does is to direct our attention into a dark place psychologically and emotionally. It is difficult to hold that attention; it is easier to want to do something 'nice'. By looking into the abyss too much we tie our psychic energy up in the abyss and may miss the flipside, the natural genius for creation, the solutions that come from the 'uplands'. A three-step process is useful for looking at this: 1) looking at where we have been; 2) looking at what could be done; 3) looking at what we as individuals, groups, organisations and institutions are able to do.

Social mobilisation

- Changing government policy with regard to energy requires social action. Change comes from below, not from above. Civil society needs to get more involved in climate change as a major issue.
- Civil society formations are not yet organised enough to achieve change in government policy.
- Influencing government is really difficult. Government will listen to you if you are providing input that they want, but on such matters as opposing pre-paid water meters, they have no interest.
- Trade unions and various NGOs have cut corporatist deals with the government but in Soweto they teach people to steal electricity safety.
- Having an adversarial relationship with government is difficult when you are completely dependent on government.

Diversifying the energy mix, improving energy efficiency, changing the structure of the economy

- There are three broad areas in which mitigation can be pursued, at three different time scales. 1) *Improving energy efficiency (demand side management)*. This is a short-term measure that should already be happening, and a range of technology should be implemented. 2) *Changing the energy mix*. This is a medium-term measure in the sense that the lifetime of power generating equipment is quite long. However, in the next 20 years we will be building 1 000MW of generation capacity per year, and this presents an opportunity to change *how* the electricity is generated. 3) *Changing the structure of the economy*. The minerals-energy complex has built competitive advantage around such things as aluminium smelters instead of renewable energy. But there is a lot of opportunity to do something different. There is international support for projects through measures like the CDM, debateable as it may be. But there is no doubt that changing the structure of an economy so

that the emphasis moves from primary sectors to secondary and tertiary structures takes a long time.

- Government has accepted the need to diversify the energy mix. The Department of Minerals and Energy (DME) has a renewable energy subsidy scheme, but it has settled for the building of more nuclear power stations. DME has developed energy efficiency strategies for government and state-owned enterprises.
- The market for gold, platinum group minerals and coal has never been as good as it is now, and is growing fast.
- We could have predicted the current power crisis 20 years ago, now we have to make a bad choice about which generation technology to use.
- There is currently a scarcity of electricity, and the argument to redistribute electricity has never been stronger. But instead government is supporting mega-projects like Coega that consume vast amounts of electricity, and most of the large companies benefiting from this cheap electricity send their profits out of South Africa because their head offices are in other countries. Stop giving the cheapest electricity in the world to these rich companies.

The potential for change in the energy system

- Complex systems include inertias and non-linear feedbacks. Change in such systems is characteristically discontinuous – you can push and push with no apparent effect, and then suddenly the proverbial butterfly wing causes a huge change. The global climate system is one type of complex system. The world's energy system is another complex system. When you shock complex systems they can change. The energy system changed dramatically in the mid-70s when the supply of oil to the West was severely constrained and there was a dramatic increase in the price.¹² We will see more dramatic changes as a result of the Cape Town blackouts than years of advocacy have been able to achieve. One more hurricane like the one that devastated New Orleans is all that is needed to change the thinking in Washington on climate change. Windows of opportunity for dramatic change occur, but they are open for a short time, and we must be prepared to seize the opportunity as soon as the window is open.

A critical lack of investment in energy research capacity and education

- The lack of capacity in South Africa's energy sector is a result of government systematically starving the sector of funding. The government does not have a single funding window for work on climate change. It has not provided support for education so there are too few graduates, and the number of experts is declining. Sasol and Eskom worked with government to dismantle advanced energy research capacity in South Africa to prevent any challenge to their dominance of the sector. They have undue influence over national energy policymaking.

¹² On 17 October 1973 the Organization of Arab Petroleum Exporting Countries (OAPEC, consisting of the Arab members of OPEC plus Egypt and Syria) announced that they would no longer ship petroleum to nations that had supported Israel in its conflict with Syria and Egypt (i.e., to the United States and its allies in Western Europe). At about the same time, members of OPEC [the Organization of the Petroleum Exporting Countries] agreed to quadruple world oil prices. The targeted countries responded with a wide variety of new, and mostly permanent, initiatives to contain their further dependency. (http://en.wikipedia.org/wiki/1973_energy_crisis)

South Africa as one of the world's top carbon polluters

- While it is true that South Africa is among the world's top 20 carbon polluters (China and India are at the top of the list), where it stands in the rankings depends on how you work out the statistics. The statement that South Africa emits 20 times as much CO² as the US is based on a calculation which includes population and GDP. Bear in mind that the US has a much larger population (almost six times as big) and a much larger GDP (more than 50 times bigger) than South Africa.
- South Africa is not high in the rankings in absolute terms, but it does not matter where in the world CO² is emitted, it is a global problem with a half-life over 100 years.

Responsibility for reducing emissions

- The North's use of the South as a carbon sink is worth US\$75 billion a year. Who owes that carbon debt? The big oil producers. Perhaps we need a carbon truth and reconciliation commission. The ecological debt movements launched the first set of reparations cases on behalf of victims of climate change under the US Alien Torts Act. They have been using the same lawyer who won reparations from Swiss banks for the descendants of victims of the Holocaust. The cases have been stalled. There are campaigns against Shell by people in the Niger Delta.
- With regard to reducing emissions, the UNFCCC refers to signatories having 'common but differentiated responsibilities according to their respective capabilities'. This is inherently unfair but, if the less-polluting countries stand too strongly on their historical rights to emit as much as the more-polluting countries, there will be no progress towards reducing global emissions. Any emission anywhere in the world is everybody's problem.
- The CDM is not a fair process, but it is a process over which we can have control. We have gone some way to establishing sustainable development criteria. There will always be filthy oil and coal barons, but we need to show leadership around these international agreements, and make sure our citizens are not marginalised by these agreements. How can we use the CDM to work for us? Government should identify potential CDM programmes in housing, transport and renewable energy. Whatever replaces the CDM will take another ten years to negotiate.
- The Kyoto Protocol only seeks emission reductions of about 5%. It includes the industrialised countries but the US and Australia have opted out. There have been further caps since the Protocol was signed, and a dialogue was launched about what developing countries would do. Realpolitik suggests that it is that Brazil, India, China and South Africa are unlikely to do anything as long as the US opts out, so we will probably have to wait for the Bush presidency to end. In the next five years there will be some kind of agreement. It will be inadequate, but will take us a step further. The Europeans, the Japanese and possibly the Canadians may do more to reduce emissions than they do now.
- George Bush has done extreme damage to the image of the US by abrogating the Kyoto Protocol, but this is at the federal level. Many of the states in the Union are aggressively pursuing greening their sources of energy. There is some state autonomy in this regard.
- The US is unlikely to sign a cap on carbon, but one more hurricane could dramatically change public opinion.
- We may never have a state that is able to externalise internalities because we don't have an all-knowing and all-powerful state.
- The island of Tuvalu is disappearing because of ocean level rise. There should be some compensation and reparations.

Carbon trading

- What we have to do as a species is to cap the whole world's emissions, equitably share out what is under the cap, and agree on a way to proceed through trading or other mechanisms.
- We must stop the carbon market before it starts, not try to make this idea work better. The Durban Declaration on Carbon Trading says, among other things: 'The carbon market creates transferable rights to dump carbon in the air, oceans, soil and vegetation far in excess of the capacity of these systems to hold it. Billions of dollars worth of these rights are to be awarded free of charge to the biggest corporate emitters of greenhouse gases in the electric power, iron and steel, cement, pulp and paper, and other sectors in industrialised nations who have caused the climate crisis and already exploit these systems the most. Costs of future reductions in fossil fuel use are likely to fall disproportionately on the public sector, communities, indigenous peoples and individual taxpayers'.¹³
- Is it helpful to put a price on carbon? I think it is helpful to internalise the external costs of this form of pollution; accepting a price on carbon does not say anything about whether you believe in markets or not.
- We will have to achieve massive reductions, but we are dappling in the shallows. At the same time, it is necessary to get the most bang for the available bucks. It does not help to spend \$100m in the US to achieve a 1% efficiency gain when you could spend the same amount of money in the developing world and achieve a lot more. The CDM allows for the selling of false 'carbon credits' and this is therefore a false saving. But the CDM is the only mechanism we have for levelling the accounts between the countries which have reduction targets and those which do not. A company may only trade 5% of its reduction target non-domestically. This is not much and the money available is not as much as it might seem at first glance. Biodiversity CDM projects may be helping to conserve biodiversity for biodiversity's sake; it does not make much of an impact on climate change.
- Most CDM agreements are rental agreements, not sale agreements, these are the 'low-hanging fruit' [most easily achievable goals] and we may be selling them cheap. Hard-core economists would say that you should decide whether you want to sell your fruit now or later.
- We have a CDM project in ten houses in Khayelitsha, retrofitting them with insulated ceilings, solar water geysers and low-energy light bulbs. Even though this is a small gain and a low-hanging fruit, it has resulted in a major mindshift about what is possible. It is a demonstration project that may be replicable nationally. Our solar water industry is very small, and energy-efficient low income housing is rare at the moment. However, once an industry is established, the capital cost of solar electricity will go down.
- A reformist approach like carbon trading strengthens the hand of those currently in charge. We need to change the logic of the system by empowering those at the bottom. Avoid low-hanging fruits that may rot. As far as the idea of carbon trading as a way of internalising externalised costs, this should be done through a tax, and if that does not make enough of a difference, the industry should be prohibited.

Local government action

- The process of local authorities providing citizens with improved access to energy is something that significantly improves their quality of life. Energy is also the primary driver of climate change and we have to decrease our dependency on fossil fuels. Climate change

¹³ www.carbontradewatch.org/durban/durbandec.html

has been a more successful integrator of governance efforts than sustainable development has been. Those in local government are now gathering around a common problem: mitigating climate change, in order to lessen the vulnerability of the population to water, flooding and drought. We want to ensure a future for nature-based tourism; to improve fire and disaster management; and to guard human health by ensuring access to decent sanitation and protection from water- and vector-borne diseases. Some local authorities have set aggressive targets for various sectors to reduce local emissions and dependency on fossil fuels.

Dams

- The Department of Water Affairs and Forestry (DWAF) keeps building dams, even though the World Commission on Dams has highlighted that rotting vegetable matter in dams is a massive contribution to greenhouse gases. DWAF must stop building large dams and the Department of Trade and Industry must stop promoting projects like Coega if government is at all serious about reducing emissions.
- Before DWAF decides to build a dam, there is a long process of ensuring the existing resources are optimally used through demand management and utilisation of ground water resources.
- Those of us with taps use more water than people without, simply because it is easy to do so. We can simply open a tap and let it run.

Transport

- Many people are interested in preventing the Antarctic from melting, but on the whole we seem paralysed because there is no political will driving and guiding individual action. We might want to ride bicycles instead of driving cars, but we may get run down because we are not part of a bigger effort.
- Car sales have never been as high as they are now. Local government should stop building new roads, make existing roads narrower, make it easy to walk and cycle, promote greening and public transport, and stimulate local economies so that less travelling is necessary. Four times as many people are killed by cars than in armed conflict.
- There should be state incentives for car-sharing.
- In many countries private transport is discouraged. In Melbourne, Australia, for example, public transport receives such preferential treatment that, if you want to get to work on time, it is better not to use your private car.
- In addition to making a contribution to mitigating climate change, people in bicycle-friendly cities have a better general quality of life.

Genetically modified crops

- There are new species of genetically modified drought-resistant crops. Some countries won't accept them, but this one way of adapting to doubt.
- There is bitterly little debate in South Africa at policy level about the planting of genetically modified crops. Crops that have been engineered to be drought-resistant could be useful, but there has not been enough research into the possibility of these becoming invasive weeds. There is a strong link with alien invasive plants and increased levels of CO² and they are the biggest threat to biodiversity after habitat loss. The second issue is profiteering by transnational corporations which 'own' modified versions of plants.

- Genetically modified crops have been opportunistically punted by their manufacturers as a solution to a crisis.
- There are cases in South Africa of genetically modified crops becoming more and more resistant to commonly-used herbicides.

We are likely to stay with a coal-dominated energy system

- We should avoid taking decisions that will lead to technical lock-in. We are locked into a coal-dominated energy future for the next 50 years. Our coal-fed energy generation systems are very inefficient – they only operate at about 30% efficiency. It is likely that, instead of moving towards alternative energy systems, or towards coal systems that are 60% efficient, we will just have more of the same.

Build a competitive advantage on solar energy

- Given our weather conditions, government has an opportunity to build competitive advantage on solar thermal electricity. Let's become the world leaders in solar energy like Brazil is the world leader in ethanol production. For global emissions to peak in the next 20 years, we have to win these political battles right now.

Technological innovation

- Systems can be developed so that people can monitor their energy usage. There is a gigantic window of opportunity in Africa to implement better and more flexible technologies that can be cheaper to install and more energy-efficient, hence cheaper to run. Africa may be able to leapfrog outdated technology in the same way as cellular phone technology has meant it is no longer necessary to lay a complex network of telephone cables. We need to open up landscapes for multiple actions, technologies and pathways. There is no one solution, and a solution we want may be just around the corner. Out of the experimentation may come something out of which the change in the energy system can come.

Initiatives that make a difference

- There is a Western Cape government regulation in the pipeline that would require all new buildings to have solar heaters. The CEO of a South African computer company became interested in renewable energy and in making a difference to the rural poor. He started a programme that traded tree growing in the rural areas in exchange for bicycles. Prof Vivian Alberts of the University of Johannesburg has invented a solar panel that is far thinner than existing solar voltaic panels, much cheaper to produce, and much more energy-efficient. One project seeks to install a solar panel on the roof of every roof in Tembisa. Large panels for use in places like schools could be stored inside to prevent theft and be wheeled out every day. Power generated in this way can be stored cheaply in cheap Chinese-made motorcycle batteries during the day, and the stored power can be drawn from the batteries at night. These batteries only cost R50 each and have a very long life. Light-emitting diodes (LEDs) are cheap to buy and very energy-efficient. It is possible to have two copper wires strung across your ceiling with LEDs attached to them. Lead-acid batteries are an environmental hazard, but the manufacturing of a new kind of battery that is not hazardous is due to start soon near Johannesburg. There is potential to scale up solar energy so that it can provide lighting and possibly energy for cooking. When the right people with the right ideas come up with the right technology, massive changes are possible. Given the emergence of the electricity crisis in the Western Cape, government is now in solution mode. Government is saying 'keep talking to us'. There is a precious window during the Western Cape winter to show that change is both necessary and desirable.

Biodiversity, adaptation and mitigation

- Climate change is the major factor in biodiversity change, although other factors like overharvesting are also very important. Something like 20% of the world's living things are under threat from climate change. What do we do to manage biodiversity loss? There is no one thing that we need to do, a variety of measures are necessary. For example, we can anticipate some of the habitat changes that will occur – species that currently flourish in certain places may migrate to higher, cooler altitudes, so currently protected areas could be extended in a way that allows for species migration within protected areas. Some species are no-hoppers – they may already be so high up a mountain that there is nowhere higher for them to go. For those species, we have to think about zoos, gardens and gene banks. Adaptation efforts aim to extend 'soft limits' – to make refinements that make it possible to do things which are not possible now. Mitigation is about dealing with 'hard limits' – those things which are not possible at any time. There are hard limits that affect the viability of our own species. The earth is self-regulatory, and it has resilient processes, but life as we know it may not be resilient. The biosphere is under no obligation to adapt itself to our comfort. It is possible for us to fail at the global scale. Avoiding the hard limits is not tomorrow's problem; we have to address it today. Within the soft limits, it becomes a matter of resource allocation. In the future it might be too warm to grow pine trees in Graskop, but the temperature might be right to grow pawpaws and make money. Efforts to protect biodiversity should be prioritised. The term 'ecosystem services' refers to benefits that people get from nature (not only pristine ecosystems, but also transformed landscapes). These include such things as slowly releasing water into rivers and dams, pollination services to agriculture, water recycling and recreation. Protecting biodiversity in the sense of preserving the richness of all kinds of life is less important than preserving the ability of natural systems to continue to produce large and dependable ecosystem services so that human beings can continue to live.