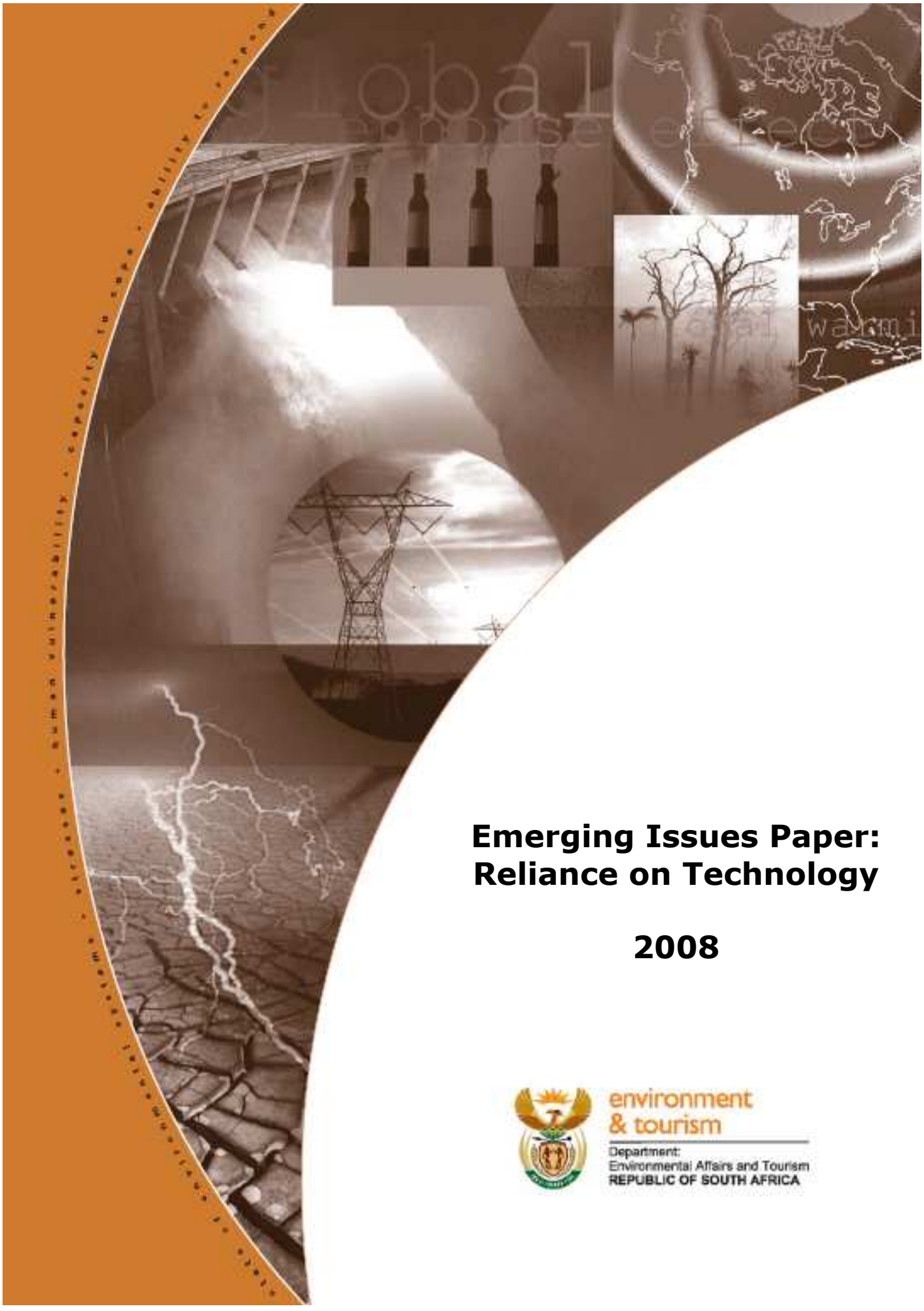

Emerging Issues Paper: Reliance on Technology

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BANE OR BOON – OUR GROWING RELIANCE ON TECHNOLOGY: A CONSIDERATION OF KEY EMERGING ISSUES THAT MAY IMPACT THE STATE OF THE ENVIRONMENT

This document provides information on emerging issues that may affect the future state of the environment. The purpose of this paper is to draw attention to issues in preparation for the next state of environment reporting cycle.

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Introduction

Technology is a broad concept that deals with a species' usage and knowledge of tools and crafts, and how it affects a species' ability to control and adapt to its environment. In human society, it is a consequence of science and engineering, although several technological advances predate the two concepts. In this essay, technology is defined as the application of scientific knowledge for practical purposes, especially in industry. In this sense, technology encompasses not only material objects of use to humanity (such as machines, hardware or utensils), but can also broader themes, including systems, methods of organization, and techniques (such as Integrated Coastal Zone Management (ICZM), town and conservation planning, or fisheries and climate models). Nonetheless, the term most often refers to new products or methods of producing them. People's use of technology began with the conversion of natural resources into simple tools. Modern societies rely increasingly on a range of increasingly sophisticated technologies in almost every sphere of daily life.

Technology today is portrayed as both the cause of environmental problems and as the only means of saving the environment. There are probably elements of truth in both of these views. For example, the technology that drives much of our production also causes the pollution that is responsible for global warming, acid rain, and human health problems. In many cases, less polluting production systems are possible only with the application of improved technology, whether to save energy, to switch to renewable energy sources or simply reduce emissions from existing power stations. Because of this, the proposed solutions to the perceived negative effects of technology are often the improvement and further deployment of existing technology, or the development of new technology. This results in a continual dependence on technological 'fixes' to solve society's problems.

One author stated "Technology, the source of the problem, will prove to contain within itself the germs of a solution" (cited in Barbour 1980). Central to this idea is the notion of continual substitutability of resource materials and the potential of technology to use resources more and more efficiently, making the earth's resources seem almost unlimited. But this view is contested by evidence of resource depletion, pollution, climate change and damage to the ozone layer, loss of biodiversity and drug resistant pests and diseases, all linked by greater or lesser extents to technology, or the poor use of it. Nonetheless, people who hold this view often assume that technology is inherently advantageous. As a result, serious discussion of the issue is rare and often couched in terms of accusing people who oppose new technologies of denying progress or trying to 'turn back the clock'. These arguments fail to realise that there are several possible pathways by which society can advance and it is valid to make conscious choices regarding the type of technology that will lead to the most desirable outcome.

There is also a tendency to dissociate technology from the uses to which it is put and the related consequences. As a trivial example, a motor manufacturer is quite entitled to produce, market and sell a car that is designed to be driven at speeds well in excess of the legal limit anywhere in the country, yet can deny responsibility for the way cars are driven. Traffic law enforcement, safety issues and a road network suitable to the vehicles are regarded as the responsibility of the government, at taxpayers' expense.

Discussion

Our technological choices and their effects pervade society and therefore are pertinent to most of the themes and issues of the South African Environmental Outlook (SAEO). The SAEO outlook calls for technology "to promote its global competitiveness, create wealth, improve the lives of its people, develop human resources and work towards environmental

sustainability", but also acknowledges that new technologies result in increased resource use and waste production. Despite this, there is little discussion regarding appropriate technological choices for helping to meet the goals listed above. In this light it is worth noting the recommendation by Constanza and Daly (1992) that technology for sustainability should focus on increasing efficiency rather than throughput.

Social aspects of technology are barely mentioned in the SAEO, and then only in positive terms. Aside from effects on the environment, the level of use and choice of technology determines patterns and levels of employment, of socialising and vulnerability. There is a concern that technologically-driven economic growth has become an end in itself and is doing too little to improve the welfare of most people. The Human Development report: South Africa (Adelzadeh et al. 2003) highlights the complex relationship between labour, productivity and technology, and makes specific reference to the role of technology in so-called 'jobless growth' of the economy. 'Our Common Future' (WCED 1987) called for the re-orientation of technology towards sustainability. It warned that rapid growth with deteriorating income distribution was worse than slower growth and better income distribution. More recent criticism is that many corporations that used to consider themselves as drivers of job growth now refer to themselves as drivers of economic growth, meaning that employees are often considered as necessary burdens rather than assets (Klein 2000).

Technology's benefits in modern society are too numerous to name. Digital technology has spread the use of telephones to areas that might have had to wait years for fixed-line telephones. Information and communication technology (ICT) has changed the way people interact and according to research, may deepen social networks and remove them from their 'normal' time and space constraints. However there is also potential for inequalities to be exacerbated by differential access to digital technology (Odendaal 2008 and references therein). Similarly, advances in the use of renewable energy provide the potential for electrification in areas where fixed lines are unlikely to reach. Small-scale water and

electrical supplies, suited to rural areas are becoming more feasible, giving access to vital facilities under local control. Medical advances have hugely improved the quality of life as well as longevity, for those who have access to them. Early warning systems and advanced weather forecasting techniques have helped to reduce vulnerability to many environmental disasters or even normal variability (Sachs 2005). Yet there are many examples of negative social and environmental effects of technology.

Environmental concerns emerged in the modern sense after World War II, due to the huge increases in production capacity and its resultant pollution. The use of chemical fertilisers and pesticides also increased, and acid rain and declining fish resources added to the concern. More recently, Mad Cow disease, which had devastating effects on agriculture in some countries, was due to inappropriate farming technology. The issue of climate change has emphasised the global nature of many technologically driven problems, while unchecked and inappropriate implementation of large-scale technologies, such as big dams has become an issue worldwide.

Part of the problem is that technology is often employed before its potential consequences have been fully explored. The effect of greenhouse gases on the ozone layer, the relationship between greenhouse gases and climate change, and the creation of huge oceanic dead spots due to eutrophication, are a few examples. Drug resistant diseases and pesticide resistant insects are direct consequences of unregulated use of technologies. Schumacher (1973) warned of the dangers of technology employed on a vast scale based on partial knowledge, and this warning has been echoed, albeit in more measured terms by Perrings (1991) who wrote that "it is a characteristic of the increasing flow of observations on the state of the global system that it contains surprises…as our knowledge of the global system increases, so does our uncertainty about the long term implications of our economic activity. Combined with the uncertainty caused by the rapid pace of change in resource use technology, this suggests that the increasing flow of information does not in fact give more

complete information." Part of the controversy about genetically modified organisms (GMOs), biofuels, 'carbon offset' programmes and others is the sense that these technologies are being widely deployed before being adequately understood.

Similarly, there are doubts about the social effects of technological advance, with the contrast between the pace of technological and social change being of concern. One view is that technology has liberated people from many of the hardships of manual labour, increased leisure time and lengthened life-spans. The other view is the that technology becomes an autonomous system that shapes humanity to its own needs, dehumanising society and undermining its values, centralising authority and homogenising cultures, causing social dislocation, inequity and vulnerability. Sachs (1992) describes an electrical socket at home as the domestic terminal of a national power system, which requires cables power stations fuel, pipelines etc., overseen by experts, and requiring centralised, often autocratic control. Since one definition of freedom in a modern society is 'the ability to participate meaningfully in decisions that affect one's life', having centralized control over such large-scale technology can then be viewed as decreasing individual freedom.

In addition, technology is often accessible only to wealthier members of society, emphasising social and economic differences, especially when technological choices are as much the result of politics and economics as of scientific innovation. Due to the need for capital investment, large-scale technology tends to concentrate wealth, deepening social inequality. In many cases, the introduction of technology results in job losses, not only because automation replaces manual labour in many cases, but also because unskilled workers become 'unemployable'. Even when jobs are not lost, the conformity demanded by mass production leads to lower quality jobs, allowing little space for creativity. Technology also concentrates industries and therefore people in cities, leading to rapid urbanisation. Due to the expense of large technology, it is often not 'rolled out' to rural or poorer areas. Indeed, in the case of big dams and

similar developments, rural communities are often displaced to make way for the developments, which primarily benefit urban populations.

It is thus clear that modern technology cannot be viewed merely as a neutral tool - it is as good or bad as the use to which it is put. However, this is not a simple issue about too much technology. The uneven distribution of technology, both among and within countries, adds another facet to it. Hence although the reliance on technology is a widespread issue, there is a split, with an excess of technology overwhelming peoples' ability to make appropriate, informed choices on one hand, and inadequate access to technology undermining peoples' quality of life on the other.

South Africa and technology

South Africa has recently shown determination to become a global player in the use and development of technology. The SALT telescope, biofuel industry, the 'pebble bed' nuclear reactor and the commitment to growing GMOs attest to this determination. Yet it is frequently pointed out that South Africa has a dual economy, deeply divided between first and third world components of society.

There is a need for technological development to better integrate the goals of ecological sustainability, poverty alleviation and social development. Historically this has not been adequately addressed. Despite the drive for South Africa to compete technologically, we are still some way from achieving this goal. As of 2001, South Africa's score on the Technological Achievement Index, as defined by the United Nations Development Programme (UNDP), was less than half that of the highest ranked country (Finland). In sustainability terms, we are also some way off the pace, as the SAEO itself makes clear. It points out that South Africa has a low ranking on the ESI (Environmental Sustainability Index), as the country grapples with reducing environmental stress, improving environmental systems' health and reducing human vulnerability. Science and technology are also listed as areas of concern. The country still has a

low number of researchers relative to total population. On the positive side, research towards cleaner energy technology is gaining ground and the Polokwane declaration, calling for zero waste within the next two decades, is a step in the right direction.

Much of the discussion in this essay links to the relationship between economic activity and resource use. Most economies aim to maximise consumption (due to the way the global economy – capitalism – is structured), but technology for sustainability demands that welfare is maximised with the minimum of added consumption. The South African economy needs to move from being growth-driven to being development-driven, i.e. move from growth that focuses on an increase in material throughput, to development that enables an increase in welfare due to efficiency of resource use and distribution.

When capital and production capacity were scarce and nature abundant, it made sense to prioritise capital, even if it resulted in waste. However the modern social and environmental situation should demand that labour and the environment are prioritised, even at the expense of some capital gains (Lovins et al. 1999). Yet much of modern technology remains expensive in resource use and is designed to be labour saving. Thus the re-orientation of technology may well require re-orientation of the economy. In this light, an alternative definition of sustainability as: '*Changes in the economic structure, organisation and activity of an economic-ecological system that are directed to maximising welfare and can be sustained by available resources*' (Braat and Steetskamp, 1991).

Conclusions

In many societies, technology has helped develop more advanced economies and has allowed the rise of a leisure class. Many technological processes produce unwanted by-products and pollution, and deplete natural resources, to the detriment of communities and the natural

environment. In addition, various technologies influence the values of a society and new technology often raises new ethical questions. Calls for the re-orientation of technology to achieve sustainability have been made frequently since the WCED report in 1987, and most recently in the SAEO (DEAT, 2006). There has also been wide acknowledgement of the need for a greater public control of technology and technological choices than currently exists. Whether this will happen is difficult to predict – it is tied up with the economic and political future that South Africa chooses. The recognition that climate change is caused by human activities has boosted efforts to re-direct technology to the development of sustainable production methods. The next step is to acknowledge that development needs to occur with as little growth in material throughput as possible, and thus facilitate the development sustainable lifestyles.

Some practical policy options for driving the process of re-orienting technology to consider are:

1) The development of clean and renewable energy resources is vital and should continue. But much more effort is needed to reduce energy demand in per capita, productivity and absolute terms. The same is true of water, where there is considerable scope for saving. Lovins *et al*. (1999) state that almost all countries tax jobs and income, and subsidise resource depletion. To remedy this, prices of water and energy and taxes on them should provide incentives for energy and water saving and increased labour, rather than for increased resource throughput. In addition, the scope of Environmental Impact Assessments (EIAs) should include an assessment of energy efficiency of new developments. This could include factors from plant design in factories to housing design and distance from supporting infrastructure in housing developments.
2) Since it is unrealistic to expect corporations to invest in technologies that do not directly benefit them, the government should directly fund more research into appropriate technological advances. Government-funded discoveries should remain in the public domain (i.e. patents should not be issued to private companies or corporations for discoveries funded by public money, or at the least there should be

compulsory licensing to local companies). This should apply to all government funded research bodies, including universities.

3) A provision should be incorporated into the World Trade Agreement that would enable member states to tailor import policies to enhance livelihood security. Such a provision could include the choice of importing new technologies.
4) The introduction of new technologies, especially those with government support, should be subject to an assessment of their likely (rather than just potential) positive and negative social and environmental effects, as well as an assessment of whether the new technology is necessary to achieve the benefits it offers.
5) Indicators of technology in future reporting scenarios should focus on the nature of technological research and advances rather than just the amount, if the aim of re-orienting technology is to be met. Investment in technologies of ecological restoration should increase. Wetlands, estuaries and degraded farmlands are prime candidates.

It is neither realistic nor desirable that the benefits of technology are ignored because of perceived negative effects. It is not the intention to suggest here that we shun technological advance to return to some form of imaginary pre-industrial utopia. But it is also undesirable that technology, driven primarily by commercial motives, should determine the futures of our physical and social environments. Schumacher (1973) called for an 'economics of permanence', which in today's language is sustainability. It is worth noting the words of the Cocoyoc Declaration (cited in Global Environment Outlook 3, UNEP 2002): "The road forward does not lie through the despair of doom-watching or through the easy optimism of successive technological fixes".

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