Chapter 2

Sustainability in South Africa

The following section outlines sustainability theory and how this has progressed over the last four decades. It is important to understand the sustainability principles in the context of future growth and development in South Africa.

Chapter 2

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2.1 SUSTAINABILITY

2.1.1 Introduction

Since the advent of democracy in South Africa in 1994, we have begun to redress many social ills and, as part of the country's transition from apartheid to representative government, planted the seeds for the emergence of an inclusive society, whilst granting millions of previously disadvantaged people improved access to education and health services, water, electricity, housing and social security, with increases in the number of people employed and reduction in poverty levels (NPC 2012).

As South Africans, we are also proud of the rich natural heritage that we hold in trust. This includes a wealth in mineral resources, one of the most important clusters of biodiversity on the planet, unrivalled solar power potential and spectacular landscapes. Our citizens recognize elements of the natural environment as part of a natural and cultural heritage – some value the land, some the sun and rain, whilst our cultural history speaks of a modern human existence based on the use of the rich natural resources that stretches back further in Africa than anywhere else on the earth. However, current patterns of production and consumption, including an environmentally unsustainable urban development model and increasing inequality, have the potential to harm some of these riches. We have recorded serious declines over recent times in South Africa in biodiversity (including ecosystems and species), our ground and surface waters are polluted; our use of land is often inefficient; and our air quality is not improving. In addition, we have specific instances of severe environmental pollution or degradation that have potentially

Box 2. 1: Sustainable production

"The emphasis of sustainable production is on the supply side of the equation, focusing on improving environmental performance in key economic sectors, such as agriculture, energy, industry, tourism and transport. Sustainable consumption addresses the demand side, looking at how the goods and services required to meet basic needs and improve quality of life - such as food and health, shelter, clothing, leisure and mobility - can be delivered in ways that reduce the burden on the Earth's carrying capacity."
Nick Robins and Sarah Roberts, Changing Consumption and Production Patterns: Unlocking Trade Opportunities. International Institute for Environment and Development and UN Department of Policy Coordination and Sustainable Development, 1997.

dangerous long term implications in terms of impacts on human and ecological systems (Box 2.1).

It therefore becomes evident that we face a challenge in continuing with the further redress of our social problems and the expansion of our developing economy in new ways that are not merely compatible with the long term health of our natural environment, but that can achieve improved results precisely because development is founded on sustainable resource exploitation. As the NDP puts it (NPC 2012):

"*The country must now find a way to use its environmental resources to support an economy that enables it to remain competitive, while also meeting the needs of society. Thus, sustainable development is not only economically and socially sustainable, but environmentally sustainable as well.*"

The following section outlines sustainability theory and how this has progressed over the last four decades. It is important to understand the sustainability principles in the context of future growth and development in South Africa. These principles provide the yardstick against which the SAEO report is developed, and assist in the tracking of our successes and shortcomings, particularly in relation to specific environmental themes and indicators.

2.1.2 History

The NDP (NPC 2012) recognizes that sustainable development is not only about maintaining economic activity and improving social welfare, but critically also about ensuring that the natural resource base will not be irretrievably depleted or damaged over time. To put it plainly, without the ability of ecosystems to continue to provide vital services such as water purification, no economic or social development will be possible. In addition, the New Growth Path (2010) focuses on social welfare and equity considerations and aims to create an additional five million jobs in the next ten years. The New Growth Path identifies five other priority areas as part of the programme to create jobs, through a series of partnerships between the State and the private sector with a focus on: green economy; agriculture; mining; manufacturing; and tourism, together with other high-level services. It is crucial that South Africa implements these strategies in a sustainable manner that will enable South Africa to grow in a more equitable and inclusive manner that supports its developmental agenda.

This is not a new realization, as the origins of the concept of sustainable development can be traced back to 1972 with the publication of the book Limits to Growth as well as the United Nations Conference on the Human Environment (the 'Stockholm Conference'). These two events recognized that the unbridled economic growth that was taking place at the time simply cannot be sustained by the natural environment, and that changes are required in the way that economic and social activities are performed. The Stockholm Conference agreed on a declaration containing 26 principles, amongst which the protection of the natural environment is recognized as having an equal importance as social and economic development. The declaration also highlighted various principles of responsible governance that are required to ensure sensible development.

The growing unease with the development trajectory experienced during the 1970s led to the birth of the 'green movement', and a series of global environmental debates that measured progress made in terms of securing a sustainable future and promoted policy directives that were required to steer development in a sustainable direction. This timeline starts with the 1980 World Conservation Strategy, published jointly by the International Union for the Conservation of Nature (IUCN), the WWF and the UNEP, within which the concept of a sustainable form of resource utilization was mooted. It recognized that our transformation of the planet has progressed to the point where conservation cannot take place in the absence of development, and vice versa, thereby establishing a clear link between what we deemed to be technological progress and its environmental impacts.

A seminal event followed in 1987, when the Brundtland Commission published the report, Our Common Future. This report contained a specific definition of sustainable development that captured public attention and popularized the concept. It defined sustainable development as "*development that meets the needs of the present without compromising the ability of future generations to meet their own needs*." Importantly, this definition added inter-generational responsibilities to the scope of environmental management. According to this ethos, the benefits of short-term economic and social development have to be weighed up against the long-term environmental impacts, and the costs not left for future generations to bear.

The Brundtland Commission's work laid an important foundation for the build-up to the 1992 United Nations Conference on Environment and Development in Rio de Janeiro, Brazil, also known as the Earth Summit. At the Earth Summit, several international conventions and agreements that remain of relevance today were opened for signature and debate. These included the Framework Convention on Climate Change, which led to the Kyoto Protocol, as well as the Convention on Biological Diversity (CBD). Most significantly though, delegates agreed to a blueprint for responsible and sustainable development, known as Agenda 21. Agenda 21 is a non-binding, voluntarily implemented action plan against which sustainable development can be measured. Indeed, it remains valid even in 2012 at the third instalment of the Conference on Environment and Development (Rio+20) where delegates reaffirmed their commitment to the strategy. In-between, the second World Summit on Sustainable Development in Johannesburg in 2002 produced the Johannesburg Plan of Implementation which seeks to expedite the realization of the original goals of Agenda 21.

Another important benchmark for sustainable development are the MDGs of the United Nations Millennium Summit of 2000. These goals include six indicators of social welfare as well as the goal of ensuring environmental sustainability, and the need for a global partnership for development. All member states of the UN have signed the declaration, and it is supported by many international organizations. The deadline set for the achievement of the MDGs is 2015.

2.1.3 Sustainability at a glance

Although debate around the concept of sustainability has been contested for a considerable time, three key principles have emerged through the course of the concept's evolution.

As population levels and consumption patterns continue to increase the impact on natural resources also increases. Conservation of the natural environment and economic development are slowly being recognized as being on the same side of the coin, rather than representing opposing faces. Development is seen as a way of funding conservation efforts, or as the process through which technology or innovation can be applied responsibly in the interest of improving the environment. Development also supports social welfare, which in turn allows people to escape conditions that trap them in a cycle of poverty and environmentally degrading activities. It should be noted that the wealthy have a much greater environmental footprint than the poor and are on the whole guilty of far more environmentally destructive activities than the poor. At both ends of the scale, human needs and desires need to be sustainably satisfied and a cohesive social network developed to prevent a depletion of natural capital.

Sustainable development has a dimension of fair and equal allocation of natural resources and value. Just as future generations should not be unfairly burdened with a compromised environment, so also should coexisting nations and communities not be unfairly compromising each other. An equitable share of resources and responsibility towards environmental protection should be universally applied.

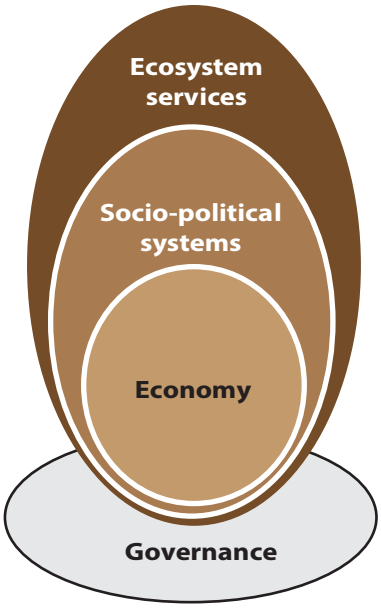

Figure 2. 1: Interlocking circles model of sustainability
Source: Todorov (2006)

Graphic representations of the concept of sustainable development reflect how these principles relate to each other. Figure 2.1 depicts the idea that sustainability is found where three spheres, the so-called three pillars of sustainability namely social, economic and environmental dimensions, interlock. This 'three-ring circus' model that shows society, economy and environment conveniently intersecting to give rise to sustainable development has become largely discredited for inter alia implying that the three components must each somehow compromise or give up something to find a settlement. The interlocking dimensions model also fails to sufficiently highlight the interdependency and hierarchy of the three dimensions.

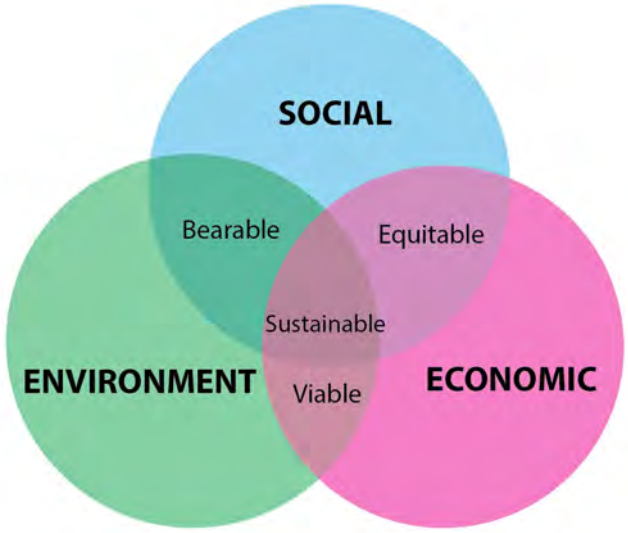

Figure 2. 2: Nested model of sustainability
Source: DEA (2012)

Sustainable development must be cognisant of the absolute dependence of both the economic and social dimensions on functioning ecosystems that can supply ecosystem services such as water, air, natural resources, disaster risk mitigation and so forth. For this reason, sustainability can be best viewed as a nested model, as illustrated in Figure 2.2.

The nested model of sustainability also shows the role of a governance system that can provide leadership and systematic and strategic guidance, as well as sanction when required. This role is necessary in order to ensure fair allocations of responsibility and obligation when it comes to the environmental and developmental spheres. The model shown in Figure 2.2 is contained within the South African NSSD. This model is developed further in Part III of this report to provide links with the DPSIR framework and the principle of individual welfare.

2.1.4 Individual welfare and sustainable development

The idea that individual human welfare (expressed as quality of life in the NDP) is the holy grail of sustainability is strongly premised on the principle that if society collapses, the welfare of the individual will be reduced, that if the economy collapses that society will be significantly weakened, and that if the environment collapses then the economy will be massively damaged. For individual welfare to be maximized, environment, economy and society must be in best possible state without compromising each other.

Max-Neef in his work titled 'Human scale development: conception, application and further reflections' (1991) forwards a series of needs and satisfiers in relation to human welfare. This provides a useful tool that links individual welfare and societal interactions to the broader economy

and provision of ecosystem services. Individual welfare can therefore be seen as central to the advancement of sustainability, and any limitations to meet basic individual welfare results in a secondary effect on economic growth and ecosystem health.

Max-Neef further states that "*a development policy aimed at the satisfaction of fundamental human needs goes beyond the conventional economic rationale because it applies to the human being as a whole. The relations established between needs and their satisfiers make it possible to develop a philosophy and a policy for development which are genuinely humanistic*."

According to Max-Neef, satisfiers can be organized within the grids of a matrix which, on the one hand, classifies needs according to the existential categories of being, having, doing and interacting and, on the other hand, according to the axiological categories of subsistence, protection, affection, understanding, participation, idleness, creation, identity and freedom (Max-Neef 1991).

The following excerpt from Max-Neef's work illustrates possible satisfiers of the need for subsistence and protection. These are by no means conclusive and is merely indicative of how needs can be met (Table 2.1).

Table 2. 1: A matrix of possible needs and satisfiers

Needs according to axiological categories (rows)	Needs according to existential categories (columns)			
	Being	**Having**	**Doing**	**Interacting**
Subsistence	Physical health, mental health, equilibrium, sense of humour, adaptability	Food, shelter, work	Feed, procreate, rest, work	Living environment, social setting
Protection	Care, adaptability, autonomy equilibrium, solidarity	Insurance systems, savings, social security health systems, rights, family, work	Co-operate, prevent, plan, take care of, cure, help	Living space, social environment, dwelling

Source: Max-Neef (1991)

2.1.5 Environmental sustainability

As a subset of sustainable development, environmental sustainability refers to the ability of the biophysical environment to maintain its functioning within natural parameters and cycles over time, in order to supply environmental goods and services to the economic and social spheres. In the South African context, this is a key issue due to our strong reliance on renewable and non-renewable resources, as well as the goods and services that ecological systems provide. Environmental goods and services are often also referred to as ecosystem services, and include a wide range of benefits that people derive from the natural environment and natural processes.

The services, materials and benefits that we derive from the natural environment range from those necessary for basic life, namely air, food and water, to those materials needed for livelihoods and well-being, as well as non-material benefits that enhances life through aesthetic, cultural and spiritual values.

Material goods derived from nature provide the basic resources required for subsistence and economic activities. All human activity is dependent on material resources being extracted from the natural environment, whether in the form of raw materials for processing or as organic foodstuffs or for the air that we breathe. This link is most evident in South Africa in rural areas where subsistence livelihoods are derived directly from productive ecosystems. Rural South Africans depend on natural water supply from rivers and other sources, biofuels (such as trees, shrubs and cow dung) for cooking and heating, pollination services from insects and small animals, natural pest control, and marine and coastal resources and wild terrestrial plant and animal products for food and medicines.

Natural resource materials are also critical for industry and manufacturing, as well as the successful functioning of our economic system. Our economy in particular is heavily reliant on the extraction and export of raw materials, whilst our primary energy generation is highly dependent on the mining of coal. The agricultural sector needs sufficient supplies of water, management of pests, nutrient cycles, pollination, and the like. Water, specifically, is necessary for most productive activities and the uninterrupted supply of food, water and energy is required to feed the high consumption oriented appetites of our urban areas.

Non-material benefits are also essential to keep the wheels of the economy turning and to satisfy recreational, aesthetic and cultural needs. With our abundant wealth in biodiversity and attractive landscapes, nature based tourism forms an important part of our economy, and a vibrant industry has been built on wildlife ranching.

All of these activities are absolutely dependent on a healthy and functional biophysical system that can maintain natural cycles, self-renew and repair, and maintain resilience during times of stresses. Ecosystem services therefore include the ability to purify and store water, renew the productivity of soils, clean the air, pollinate crops, prevent topographical instability etc.

A useful classification of ecosystem services is offered by the Millennium Ecosystem Assessment (2003). According to the Assessment, ecosystem services are either provisioning, regulating, cultural or supporting. Provisioning services provide basic resources or materials, regulating services maintain ecosystem processes, and cultural services include all the non-material benefits of ecosystems. Supporting services are necessary for the functioning of all other ecosystem services (Table 2.2).

Table 2. 2: Classification of ecosystem services

Provisioning services	Regulating services	Cultural services	Supporting services
• Food • Fibre • Fresh water • Fuelwood • Biochemicals • Genetic resources	• Climate regulation • Disease regulation • Water regulation • Water purification • Pollination	• Spiritual or religious • Recreation or tourism • Aesthetic • Inspirational • Educational • Sense of place • Cultural heritage	• Soil formation • Nutrient cycling • Primary production

Source: Millennium Ecosystem Assessment (2003)

2.1.6 Planetary boundaries and the social foundations

The concern that we as human beings are living beyond the capacity of the natural environment is becoming increasingly pervasive. We are living in a time where anthropogenic climate change is threatening the ability of planetary scale biophysical systems to maintain a natural equilibrium that has been evident for the past 10,000 years. This period of equilibrium in the natural system is known as the Holocene, and marks an interglacial period during which climatic conditions were stable enough at a continental and global level to allow modern humans to invest in the large scale modifications of their natural environment that were necessary for agriculture and complex societies to develop (Rockström *et al*. 2009).

Our ability to alter our environment has, however, now developed to the extent that our activities have become the dominant force determining change in the Earth System (the integrated biophysical and socio-economic processes and interactions taking place on land, in water and in the atmosphere). This period of human dominance is termed the Anthropocene. The risk that we now face is that our ability to modify the environment, through processes such as industrialization and urbanization could outstrip the ability of critical biophysical systems to absorb the changes and remain within the boundaries of what is considered 'stable'.

One particular concern is that the planet's biophysical systems have finite boundaries or thresholds within which they currently function. Should the systems be forced beyond these thresholds, equilibrium will be lost, and the systems will self-adjust to new levels of equilibrium. Such self-adjustment will necessarily involve drastic and abrupt changes to climatic conditions or productive capacities. It therefore follows that a 'safe operating space' can be defined for human activities – a level or form of human activity that does not transgress Earth System parameters (Rockström *et al*. 2009). The parameters within which the Earth System can remain in balance are termed planetary boundaries as they operate on a planetary scale, and bind all humans to a common fate due to their interconnectedness.

Nine planetary boundaries (Figure 2.3) have been defined by a group of scientists associated with the Stockholm Resilience Centre, namely climate change, biodiversity loss, biogeochemistry, ocean acidification, land use, freshwater, ozone depletion, atmospheric aerosols and chemical pollution (Rockström *et al*. 2009). Of these, it is argued that three, biodiversity loss, climate change and the nitrogen cycle, have already entered into a danger zone that is beyond commonly considered tipping points. These aspects therefore have the ability to now plunge the Earth System into an adjustment phase that will disrupt biological activity as we know it. In addition, indications are that freshwater use, land use change and the phosphorous boundaries might also be at risk of being crossed.

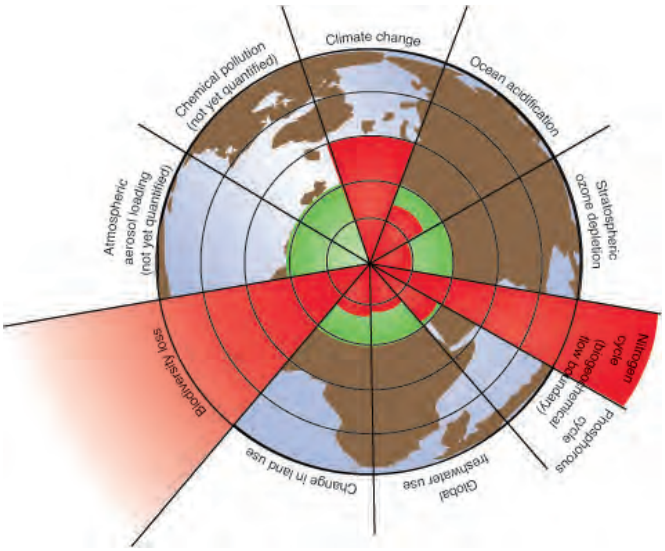

Figure 2. 3: Planetary Boundaries
Source: Azote (2009)

Oxfam has recently, however, highlighted the fact that a sustainable human existence needs to consider social dimensions along with engagements on the biophysical environment (Raworth 2012). Accordingly, they proposed that thresholds of social justice be determined and measured along with the biophysical planetary boundaries. The underlying thinking is that social justice and personal safety will always trump self-sacrifice for the sake of environmental management. Put plainly, survival first, and saving the planet, second.

Accordingly, 11 key social priorities that need to be satisfied before environmental degradation will be arrested, have been defined. These are food security, adequate income, improved water and sanitation, health care, education, decent work, modern energy services, resilience to shocks, gender equality, social equity, and having a political voice. Max-Neef (1991) would also include the satisfiers of freedom and idleness.

It is therefore possible to visualize a living space for humans that is built on the foundation of safe and just social conditions, but limited through a ceiling of environmental thresholds. This space was conceived graphically as a circular graph (Figure 2.4), and hence became known as the 'doughnut' (Raworth 2012).

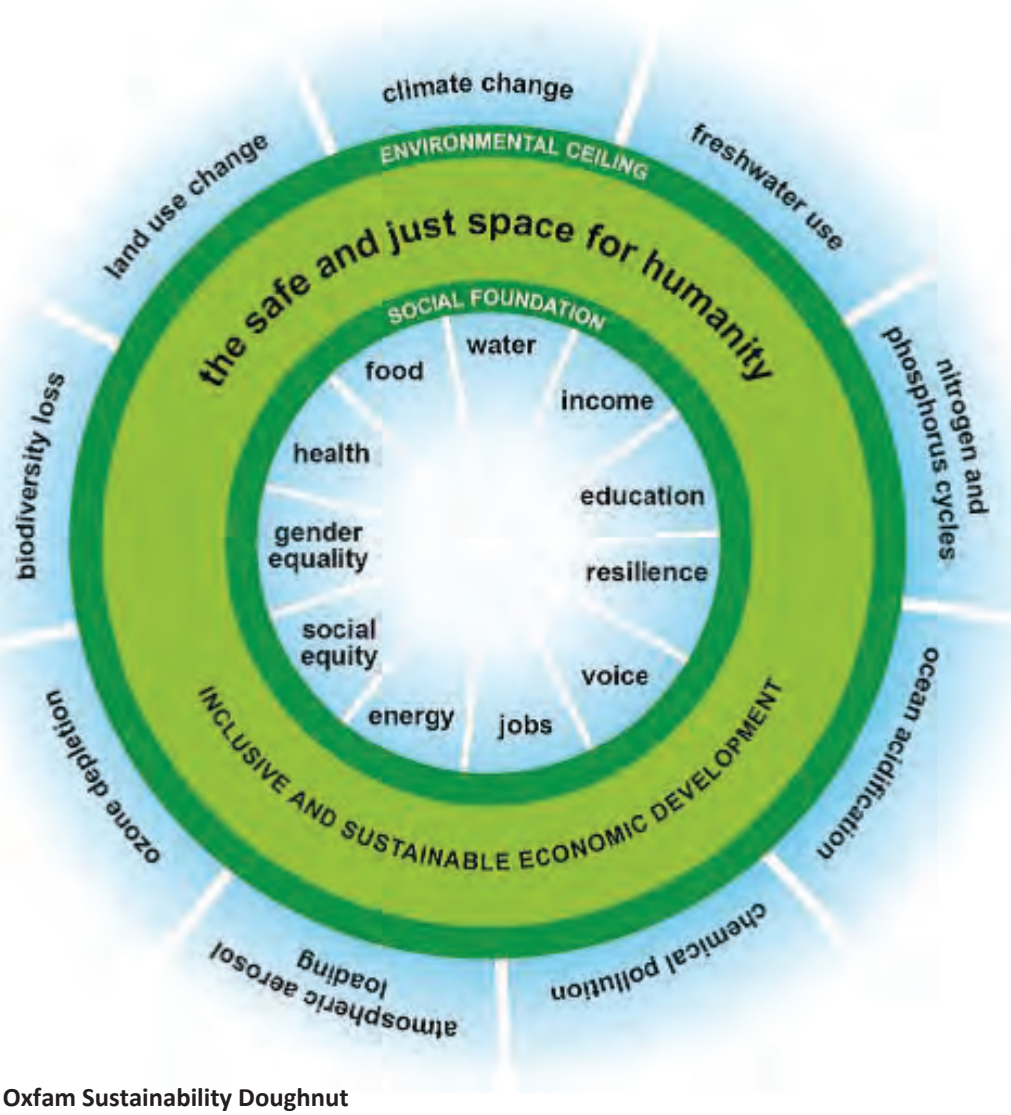

Figure 2. 4: The Oxfam Sustainability Doughnut
Source: Raworth (2012)

For inclusive and sustainable economic development to occur, society needs to ensure that the 11 social deprivation indicators are fulfilled, whilst responsible management of human activities prevent the forcing of planetary systems beyond their current stable state.

2.2 SUSTAINABILITY IN SOUTH AFRICA

2.2.1 National Framework for Sustainable Development

In response to the sustainable development agenda, South Africa has adopted the National Framework for Sustainable Development (NFSD) (DEA 2008). The purpose is to express the national vision for sustainable development and indicate strategic interventions to re-orientate South Africa's development path in a more sustainable manner. The growing stress on environmental systems and natural resources from economic growth and development strategies were explicitly acknowledged. The NFSD commits South Africa to a long-term programme of resource and impact decoupling.

The vision for a sustainable society is: "*South Africa aspires to be a sustainable, economically prosperous and self-reliant nation that safeguards its democracy by meeting the fundamental human needs of its people, by managing its limited ecological resources responsibly for current and future generations, and by advancing efficient and effective integrated planning and governance through national, regional and global collaboration*" (DEA 2008).

The framework also outlines principles and trends regarding sustainability in the country, as well as a set of implementation measures. Key to the framework is how this can be achieved through partnerships with civil society and entrenching co-operative governance practices.

South Africa has adopted a systems approach to sustainability (Figure 2.2) which is one where "*the economic system, the socio-political system and the ecosystem are embedded within each other, and then integrated through the governance system that holds all the other systems together in a legitimate regulatory framework. Sustainability implies the continuous and mutually compatible integration of these systems over time. Sustainable development means making sure that these systems remain mutually compatible as the key development challenges are met through specific actions and interventions to eradicate poverty and severe inequalities*" (DEA 2008).

Sustainable development implies the continuous and mutually compatible integration of these systems over time.

2.2.2 National Strategy for Sustainable Development

The NSSD identifies five strategic interventions required to achieve the nation's vision for sustainable development (DEA 2011), as redefined versions of the strategic pathways identified in the 2008 NFSD, namely:

- Enhancing systems for integrated planning and implementation;
- Sustaining our ecosystems and using natural resources efficiently;
- Towards a green economy;
- Building sustainable communities; and,
- Responding effectively to climate change.

The strategy further identified the means of implementation that is finance, technology, capacity building and trade, as illustrated in Figure 2.5.

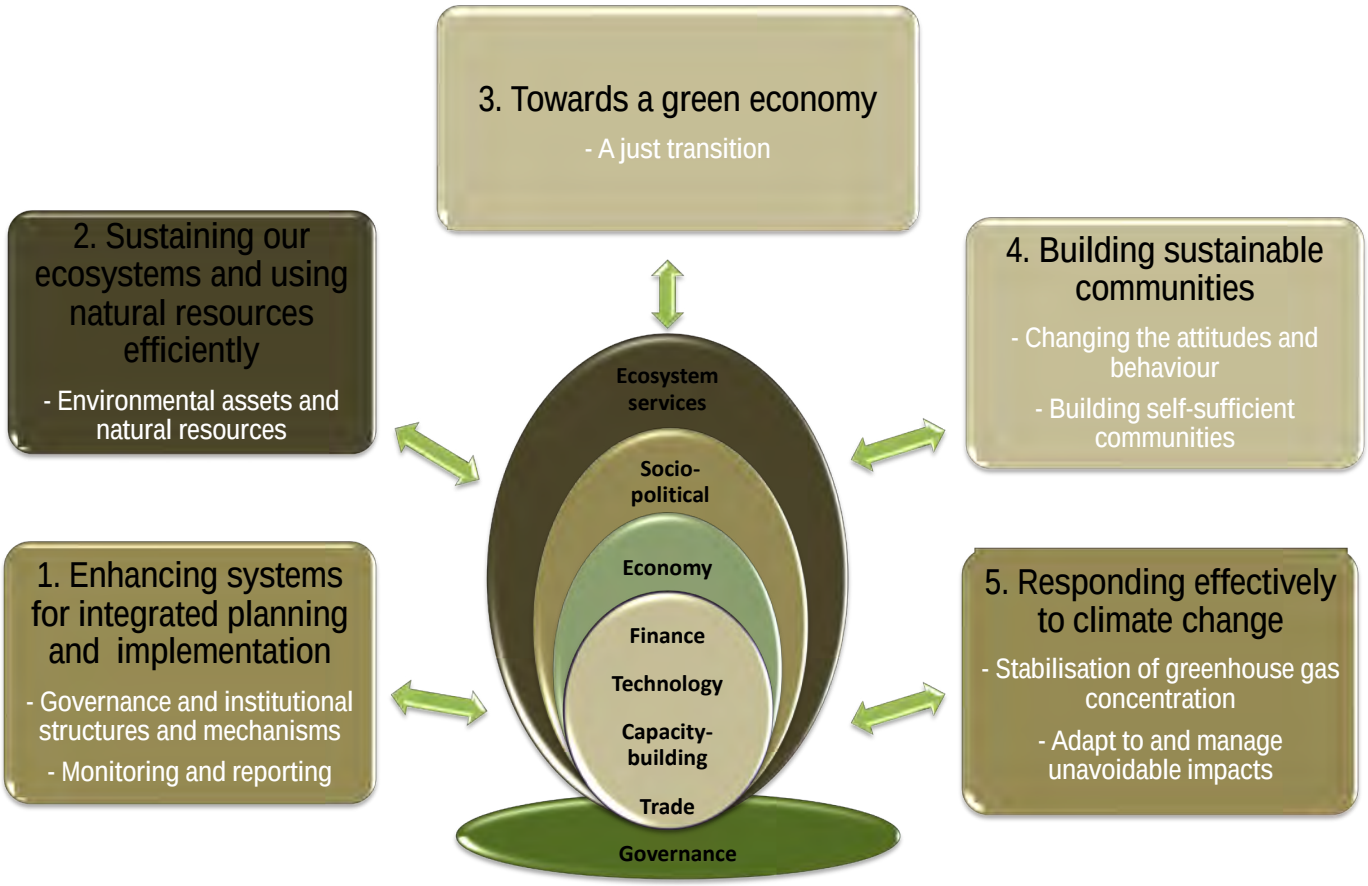

Figure 2. 5: Nested model of sustainability, priorities and means of implementation
Source: DEA (2012), adapted from Stafford and Brent (2011); Musango and Brent (2011)

2.3 MEASURING ENVIRONMENTAL SUSTAINABILITY

Being in a position to know how sustainable our human activities and environmental management practices are, is a key step towards identifying and addressing aspects that reduce overall sustainability. Sustainability reporting is thus featuring increasingly on the world leaders' agenda, especially since by definition sustainability ranks environment, society and economy equally. Sustainability reporting therefore attempts to monitor the success in each sphere of human endeavours and report on their relative performance in a manner that can highlight the tensions between them as well as the trade-offs to be negotiated. In addition, sustainability reporting needs to provide guidance as to which dimensions or relationships need to be addressed in order to improve overall sustainability.

Because sustainable development and environmental sustainability are such wide ranging concepts, many different systems for reporting on sustainability exist, each with a slightly different focus area or reporting format. Some examples include corporate reporting schemes such as the Global Reporting Initiative, popular social well-being indices such as the Happy Planet Index of the New Economics Foundation, and the Ecological Footprint concept promoted by the WWF.

In the context of a SoE report, such as the SAEO, it can be expected that the balance of information being collected and reported on will lean towards a description of the biophysical rather than social and economic. The information on its own is therefore intended as a means to provide the reader with an indication of the health of the natural environment. To add further value to the report's findings though, the environmental report card needs to be interpreted in terms of the relationships between the natural, social and economic spheres. Social and economic information generally tend to function more as informants on the pressures and impacts affecting the natural environment. Such sustainability reporting will thus point out reasons for poor environmental performance, impacts that can be ascribed to the good or bad performance, as well as key aspects of society that can be targeted in order to redress shortcomings.

2.3.1 Ecological footprints

Ecological footprints are a tool that reflects the renewable resources that people consume against bio-capacity (ability for renewable resources to regenerate) (Global Footprint Network 2011). They aggregate calculations for a cropland footprint, grazing footprint, forest footprint, fishing ground footprint, carbon footprint and built-up land. The measurement unit for ecological footprints is the amount of global hectares (g/ha) affected by humans per capita of a country.

The world's average bio-capacity is 1.8 g/ha per person (Global Footprint Network 2011). This means that globally, there is an ecological deficit of 0.9 g/ha per person (6,000 million people on earth in total). If a country has insufficient ecological resources to match the demand of people, then it is an ecological debtor country (high over-consumption).

Although South Africa's ecological footprint is below the global average of 2.7 g/ha, the country is in ecological deficit (-1.18 g/ha) (Table 2.3). In comparing ecological footprints, South Africa compares poorly to Brazil which has a population size almost four times larger, and to Australia which has half the South African population size.

Table 2. 3: Ecological footprint of countries

Country	Population size (millions)	Ecological footprint*	Bio-capacity*	Ecological remainder*
Ecuador	13.34	1.89	2.33	0.44
Australia	20.85	6.84	14.71	7.87
South Africa	49.70	2.32	1.14	-1.18
UK	61.30	4.89	1.34	-3.55
Brazil	190.20	2.91	8.98	6.07
US	308.67	8.00	3.87	-4.13
India	1,164.67	0.91	0.51	-0.40
China	1,336.55	2.21	0.98	-1.23

**g/ha per person*
Source: Global Footprint Network (2011)

In the 2006 SAEO report, South Africa's environmental sustainability was profiled using the Ecological Footprint index of the WWF and the Environmental Sustainability Index from Yale University. The ecological footprint is a hard measure of how resource intensive our activities are, whereas the Environmental Sustainability Index provides a more integrated perspective that relates environmental systems to human vulnerability and social custodianship over the environment. The first index, the ecological footprint, calculates the impact that people's consumption of natural resources and disposal of waste have on the planet, and expresses it in terms of how much biological productivity is required to absorb the impact. In other words, the index shows how much productive land and water area is necessary to produce food, energy and materials, as well as to absorb wastes, as required by a particular way of living and prevailing technology. Should the total required biologically productive area be more than what is available, then the levels of production and consumption that are being measured are not considered sustainable. Only when the ecological footprint can be absorbed within the regenerative and absorptive capacity of the natural system can it be considered sustainable over time.

The first Ecological Footprint Index was reported in 1996, and it was found that the world average footprint is 2.85 g/ha) per person (WWF 2000). Global hectares represent the fraction of the biosphere necessary to maintain the current material throughput of the human economy, under current management and production practices. Africa's average was 1.33 g/ha per person, but South Africa had a footprint of 4.04 g/ha per person.

By 2005, the global footprint had reduced slightly to 2.7 g/ha per person, at which level it remained in 2008 (the most recent measurement). This footprint indicates that people uses the equivalent of 1,5 earths to sustain their activities (WWF 2012).

South Africa's ecological footprint was revised to 2.55 g/ha per person in 2008, based on a refined assessment of the biocapacity of the country's natural resources, whilst Africa as a whole had risen to 1.4 g/ha per person (WWF & AfDB 2012). Out of 151 countries for which measurements are available, South Africa ranks at number 80, roughly in the same range as Botswana (number 87 at 2.8 g/ha per person) and Brazil (number 90 at 2.9 g/ha per person; Abdallah *et al*. 2012). This also represents the fourth highest footprint of sub-Saharan countries (out of 37 countries) (Abdallah *et al*. 2012). The largest contributor to South Africa's ecological footprint remains carbon emissions (WWF & AfDB 2012) which result from a heavy reliance on fossil fuel derived energy, especially coal.

The comprehensive approach from Yale University, the Environmental Sustainability Index, ranks countries in terms of a diverse set of socio-economic, environmental, and institutional indicators that characterize and influence environmental sustainability. The last Environmental Sustainability Index was calculated in 2005, when it was replaced by an Environmental Performance Indicator that focuses on environmental policy outcomes.

The Environmental Sustainability Index was designed to track 76 different elements of environmental sustainability, including natural resource endowments, past and present pollution levels, environmental management efforts, contributions to the protection of the global commons and the capacity of a society to improve its environmental performance.

South Africa's Environmental Sustainability Index rank in 2005 was 93rd out of 146 countries (Esty *et al*. 2005). The score of 46.2 ranks it lower than many of its SADC neighbours. Compared to member countries of the New Partnership for Africa's Development (NEPAD), South Africa ranked 20th out of 40, with Gabon, the Central African Republic, Namibia, and Botswana in the first four places.

Since 2006, however, the Environmental Sustainability Index was transformed into the Environmental Performance Index that focused even more on the environmental issues for which governments can be held accountable. It aims to measure policy efficacy (i.e. performance) by comparing a country's actual environmental management status to universal policy targets. The lower the Performance Index score, the further away from policy goals a country would find itself. In total, 22 performance indicators are tracked, which then measure performance in terms of two broad policy outcomes – Environmental Health and Ecosystem Vitality. Environmental Health relates to environmental stresses on human health, and Ecosystem Vitality to natural resource management. This Environmental Performance Index is not comparable to the Environmental Sustainability Index due to differences in data sources, imputations, methodology, framework, target setting, weighting, and aggregation, but both remain equally valid in their own rights.

Out of the 132 countries that were assessed for the Environmental Performance Index, South Africa ranks extremely poorly at number 128, with a low overall score and a trend that is worsening (Emerson *et al*. 2012). This also ranks the country as the worst performer of 21 countries in Sub-Saharan Africa. Our closest ranked neighbours are Angola and Mozambique, at numbers 13 and 12 respectively. When considered in terms of the two main categories of policy outcomes, South Africa's Ecosystem Vitality (environmental management) is classified as poor and declining, whilst the Environmental Health (environmental impacts on human health) is regarded as poor but improving.

The poor Environmental Performance score is attributed to practices used to manage the country's water scarcity, contribution to climate change, air pollution, agricultural practices and poor public health. This echoes the findings of the 2005 Environmental Sustainability Index that highlighted air and water quality, contribution to climate change and human vulnerability as particular problems.

South Africa's relative water scarcity has resulted in many watercourse modifications, which impact on aquatic ecosystems, water security, wetlands and ecological reserves. This leaves the country with a poor overall score for ecosystem-related effects of water use, whilst worryingly the trend analysis of the Environmental Performance Index shows that the trend is still strongly negative. Urgent intervention is therefore necessary to improve the efficiency of water use and overall water resource management, including the management of freshwater ecosystems.

In the related field of agricultural practices, the two indicators of agricultural subsidies and pesticide regulation both leave room for improvement, since the absolute score is low, and the trend still downwards.

Climate change and air quality are measured in terms of effects on human health (i.e. Particulate Matter ($PM_{2.5}$) and indoor air quality), effects on ecosystems (i.e. sodium dioxide), contributions to greenhouse gases (i.e. carbon dioxide) and renewable energy. South Africa scores low in all of these except $PM_{2.5}$, indicating that despite there being policy commitment towards climate change mitigation and a reduction in air pollution, the commitment still needs to be translated into concrete action. Interestingly though, the carbon dioxide output per capita is increasing whilst the overall greenhouse gas intensity of the economy (carbon dioxide emissions per unit GDP) is improving. This is counterpoised by other air quality aspects that are deteriorating as outlined in Chapter 10: Air Quality.

The remaining poor performance area is public health, as measured by childhood mortality. Mortality in children below the age of five is greatly influenced by environmental factors, and therefore it can be assumed that most people in South Africa actually live in environments of low quality that place severe stress on living conditions. Ideally, the decline in the environmental index should be addressed in a manner that can support the improving trend in human health albeit of a low base.

The Ecological Footprint and Environmental Performance Index represent relative and indicative rather than absolute gauges of environmental performance. Global scale indices are difficult to maintain due to the large amount of uncertainty associated with data collection, reporting, data standards and socio-political challenges. It is therefore necessary to regard such rankings with the necessary circumspection that will compensate for inaccuracies and uncertainties. Nevertheless, broad trends and relative scores do hold value, and should be used as high level warning signs for aspects of environmental management that are deviating from an optimal course. The tools also offer a better understanding of our role in the global system and provide information on which to base our participation in the global debate on the environment-development interface.

In the South African context, there have been initiatives to introduce sustainability indicators through the StatsSA census as this provides a systematic process of acquiring information. These include aspects relating to renewable energy, access to public transport, urbanization patterns and use of natural resources. It is anticipated that the ongoing inclusion of sustainability indicators will provide a more comprehensive picture of key sustainability issues, as well as the performance of South Africa in terms of sustainable development.

Government performance of these strategic interventions is intended to be tracked through means of monitoring and reporting on 113 interventions and 20 headline indicators that respond to MDGs and Government Outcome processes.

In addition, the NSSD and Action Plan proposes that identified indicators be monitored through quarterly non-financial reports. These reports will have to be linked to programme outputs or strategic objectives contained in the Annual Performance Plans of government departments, municipalities and public entities (DEA 2011).

2.4 CONCLUSION

South Africa has done well in defining sustainability and sustainable development and the adoption of the NFSD commits the country to a long-term programme of resource and impact decoupling. The Framework however, acknowledges that there is growing stress on environmental

systems and natural resources from economic growth and development strategies. The country has continued to build on the Framework and several initiatives launched by key role players have adopted the NSSD which redefined strategic pathways and means of implementation. The Strategy is seen to be making a worthy contribution towards the understanding and achievement of sustainable development in the South African context. Furthermore, its five strategic priorities set a high standard for future development and contains numerous indicators which are well formulated and measurable.

There is however still significant work to be done to reverse the many prevalent negative trends identified in the measurement of environmental performance. In response, government in partnership with community organizations, business and academia are putting in place structures and strategies to turn the situation around. The chapter on Governance (Chapter 4) will discuss this in more detail.

2.5 REFERENCES

1. Abdallah, S., Michaelson, J., Shah, S., Stoll, L., Marks, N. (2012). *The Happy Planet Index: 2012 Report: A global index of sustainable well-being.* New Economics Foundation, London.

2. Azote (2009). *The Nine Planetary Boundaries.* Stockholm Resilience Centre.www.stockholmresilience.org.

3. DEA (Department of Environmental Affairs), (2011). *National Strategy for Sustainable Development and Action Plan (2011 – 2014)*. Department of Environmental Affairs, Pretoria.

4. DEA (Department of Environmental Affairs), (2008). *National Framework for Sustainable Development.* Department of Environmental Affairs, Pretoria.

5. DEA (Department of Environmental Affairs), (2012). *Overview of National Strategy for Sustainable Development.* Department of Environmental Affairs, Pretoria.

6. Emerson, J.W., Hsu, A., Levy, M.A., de Sherbinin, A., Mara, V., Esty, D.C., and Jaiteh, M. (2012). 2*012 Environmental Performance Index and Pilot Trend Environmental Performance Index.* New Haven: Yale Center for Environmental Law and Policy.

7. Esty, D.C., Levy, M., Srebotnjak, T. and de Sherbinin, A. (2005). *2005 Environmental Sustainability Index: Benchmarking National Environmental Stewardship*. New Haven: Yale Centre for Environmental Law and Policy.

8. Max-Neef, M.A. (1991). *Human scale development – Conception, application and further reflections.* Apex Press, New York.

9. Millennium Ecosystem Assessment (2003). *Ecosystems and human well-being: a framework for assessment.* Millennium Ecosystem Assessment, Island Press, Washington.

10. New Growth Plan (2010). *The New Growth Plan: The Framework.* South African Government. http://www.info.gov.za/view/DownloadFileAction?id=135748.

11. NPC (National Planning Commission), (2012). *National Development Plan 2030: Our future – make it work.* National Planning Commission, Pretoria.

12. Rockström, J., Steffen, W., Noone, K., Persson, Å., Chapin III, F. S., Lambin, E., Lenton, T. M., Scheffer, M., olke, C., chellnhuber, H., Nykvist, B., de Wit, C. A., Hughes, T., van der Leeuw, S., Rodhe, H., Sörlin, S., Snyder, P. K., Costanza, R., Svedin, U., Falkenmark, M., Karlberg, L., Corell, R.W., Fabry, V. J., Hansen, J., Walker, B., Liverman, D., Richardson, K., Crutzen, P. and Foley, J. (2009). Planetary boundaries: exploring the safe operating space for humanity. *Ecology and Society* 14(2):32. http://www.ecologyandsociety.org/vol14/iss2/art32/.

13. Raworth, K. (2012). *A Safe and Just Operating Space for Humanity: Can We Live Within the Doughnut?* Oxfam Discussion Papers, Oxford.

14. Todorov, V. (2006). System sustainability and development sustainability: Modelling problems (Is Econometrics of sustainable development possible?). *Management and Sustainable Development* 18(3-4):136–140 (in Bulgarian).

15. WWF (World Wide Fund for Nature). (2000). *Living Planet Report 2000*. World Wide Fund for Nature, Gland, Switzerland.

16. WWF (World Wide Fund for Nature). (2012). *Living Planet Report 2012.* World Wide Fund for Nature, Gland, Switzerland.

17. WWF (World Wide Fund for Nature) and AfDB (African Development Bank. (2012). *Africa Ecological Footprint Report.* World Wide Fund for Nature and African Development Bank, Switzerland and Tunisia.