



BACKGROUND

The Global Problem

- 70,78% of the earth's surface is covered by water (Engelbert, 2006)
- 2,8% of water on earth is fresh (35 million m³) (WaterAid International, 2007)
- 30% of the fresh water (105 million m³) is accessible
- 70% of the fresh water (73,5 million m³) is used for irrigation and agriculture
- 22% of the fresh water (23,1 million m³) is used for industry
- 8% is used domestically (8,4 million m³) (UN Water, 2008)

In South Africa:

- 72% of fresh water is used for agriculture
- 17% for domestic use
- 11% for industry (EarthTrends, 2003)

Each person needs per day:

- 2 - 4 liters of water to drink
- 20 – 45 liters of water for cooking and cleaning
- 2000 – 5000 liters of water to produce daily food intake (UN Water, 2008)

Predictions are that by 2025, 1800 million humans will experience extreme water scarcity whilst 66% of people will have to deal with water shortages (UN Water, 2008).

The human body consists of between 65% and 90% water (New World Encyclopaedia, 2008), and the human brain between 77% and 78% (Chudler, 2009).

It becomes apparent that the water crisis will soon be personal and that water needs to be conserved in any way possible. This dissertation aims to identify strategies that will conserve and optimize the use of water in the built environment through raising awareness of water systems and cycles.

RELEVANCE OF THE PROPOSED SITE

The significance of the site can be ascribed to the presence of the Apies River that bisects it. Not only does the river have recreational, visual and environmental potential, but the river has historical value because the good water quality and quantity was one of the reasons that Pretoria was established in its current location.

The site forms part of an east-west pedestrian link as discussed in chapter 1 (figure 3).

On a north-south alignment the site forms part of a series of proposed public open spaces that uses the Apies River as a spine (Student urban design framework chapter 1 figure 2).

The Student Urban Design Framework (chapter 1) proposes an open space system that aims at bridging the gap that the concrete channel creates between the old core of the city and the suburbs of Sunnyside and Arcadia.

The bare site is a brownfield site but has the potential for major sustainable water interventions that will improve the quality of urban open space and social interaction in the city.

WORLDWIDE CHANGES

Water is only one of the resources that are wasted. Global climate change and environmental disasters are increasing awareness of the situation and are changing people's attitude towards nature and how resources are mismanaged and wasted.

Concepts like sustainable development have been on everyone's lips since the World Conservation Strategy of 1980 (Rosenberg, 2007). The Brundtland Commission has defined sustainable development as "development that meets the needs of the present without compromising the ability of future generations to meet their own needs" (Rosenberg, 2007).

The 1992 Earth Summit in Rio de Janeiro (United Nations Department of Public Information, 1997) and the resulting action plans set the stage for future development.

THE ROLE PLAYERS

It is evident that the crisis is global, on an economic and environmental level. International agencies, along with governments worldwide and environmental awareness initiatives in South Africa aim at informing and empowering the public on how to live more sustainably through principles such as 'Reuse, Reduce, Recycle and Respect' (Greenworks, 2008).

Although "Agenda 21, the Rio Declaration on Environment and Development, the Statement of Forest Principles, the United Nations Framework Convention on Climate Change and the United Nations Convention on Biological Diversity" (United Nations Department of Public Information, 1997) along with various national and local laws, legislations, bylaws, planning policies and initiatives attempts to inform people and improve the sustainability of society, the efforts do not have a large enough impact fast enough.

SUSTAINABLE DEVELOPMENT DEFINED

Sustainability has been defined in the following ways

- “Sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs. It contains within it two key concepts: the concept of needs, in particular the essential needs of the world’s poor, to which overriding priority should be given; and the idea of limitations imposed by the state of technology and social organization on the environment’s ability to meet present and future needs.” (World Commission on Environment and Development, 1987, p. 43)
- “Living standards that go beyond the basic minimum are sustainable only if consumption standards everywhere have regard for long-term sustainability... and sustainable development requires the promotion of values that encourage consumption standards that are within the bounds of the ecological possible and to which all can reasonably aspire” (World Commission on Environment and Development, 1987, p. 44)
- “To a large degree, environmental management should be seen as a means of attaining the wider objectives of sustained economic growth and poverty alleviation” (World Bank, 1987)
- “Sustainable development describes a process in which the natural resource base is not allowed to deteriorate. It emphasizes the hitherto unappreciated role of environmental quality and environmental inputs in the process of raising real income and the quality of life” (Pearce, 1993, p. 8)
- “A style of development that, in each eco-region, calls for specific solutions to the particular problems of the region in light of cultural as well as ecologi-

cal data and long-term as well as immediate needs” (Hettne, 1990, p. 186)

To summarize

Sustainable development manages resources and the environment in a way that addresses the basic needs of all people, while re-aligning consumer values and creating resource management strategies for each region in a way that does not diminish the future continuation of nature and man in a consistent way.

SUSTAINABLE DEVELOPMENT IN SOUTH AFRICA

The approach of the South African government

On a national level in South Africa, “...the challenge of sustainable development means eradicating poverty via programs that engage all sectors. The South African economy also needs to grow in a more socially equitable way, where energy and resources are used in a more efficient manner, producing less waste.” (Eco-Logic Publishing, 2007)

It seems that the government deems stimulating the economy and eradicating poverty as the main goals of sustainability in South Africa.

Figure 5 (Eco-Logic Publishing, 2007) diagrammatically illustrates the National Strategy for Sustainable Development. This can be interpreted that economy, socio-political systems and ecosystem services are all embedded in each other but that economy forms the core.

The *triple bottom line approach* stresses that sustainable development depends on the intersection of nature, society and economy.

The author is of opinion that a hierarchical approach must be followed. Governance should be the foundation of sustainability. The first level should be eco-system services as it supports all life forms. Economy (the second lev-

el) relies on ecosystem related resources, thus depending on nature and lastly a stable sociopolitical environment relies on eco-system services and a prospering economy. As the low levels in the hierarchy supports the upper levels, the lower levels can function without the levels above them, but not the other way around (as a good economy cannot thrive without natural resources, see figure 6).

THE PROBLEM WITH SUSTAINABLE DEVELOPMENT

Systems such the 'Sustainable Building Assessment Tool' (SBAT) in South Africa (CSIR, 2008) and 'Global Community Assessment Centre' (Politics and Justice without borders, 2004) have introduced means of measuring sustainability, but have not been widely accepted by the built industry or enforced through building standards by governments or local municipalities and have never had a focus or inclination towards Landscape Architecture.

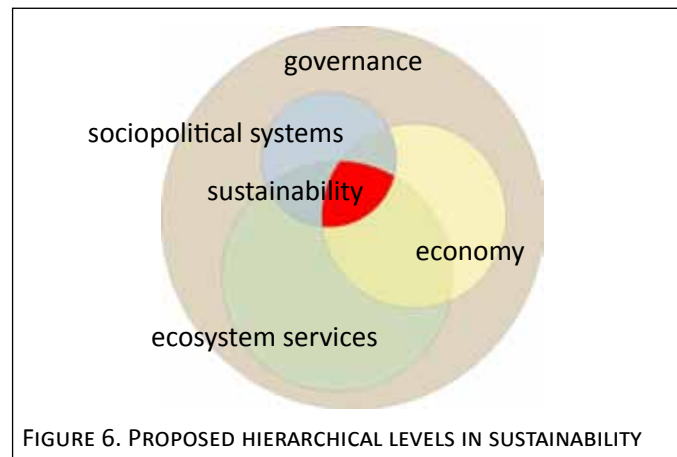
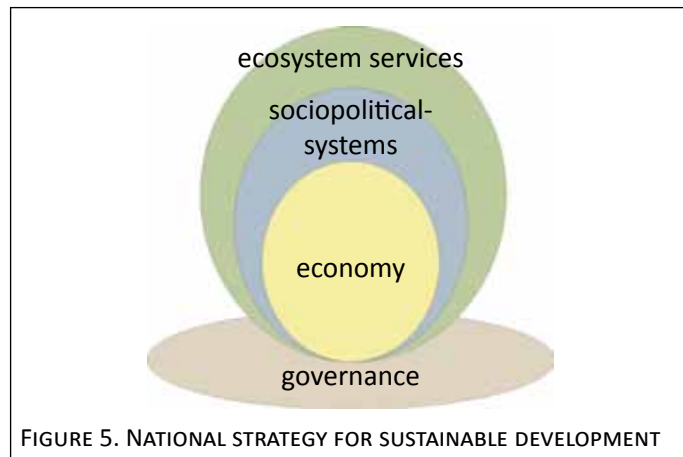
Although sustainability lies at the core of Landscape Architecture, there are a landscape designs that disregard regional and site specific conditions (water, soil, climate, habitat and human use). These ignorant designs are re-

source intensive and are often green deserts.

The false perception that all landscapes are sustainable creates the illusion that a green rating tool for Landscape Architecture is unnecessary, which leads to ignorant designs.

The author is of the opinion that schools of Landscape Architecture in South Africa do teach sustainable principles, but mostly from a philosophical point of view and that strategies along with measurable outcomes are neglected. Thus an education of the public and a more focussed tertiary program could address this issue.

GREEN DESIGN



Green is a term used in construction and product design that describes a product, material or system that aims at being more efficient or reducing an impact. *Green* can therefore still be unsustainable, although the product or material functions better than older technology in terms of efficiency and design (Squidoo, 2009).

MEASURING GREEN

Worldwide events after the 1992 World Summit that lead to the development of the 'green industry' in South Africa

- 1993: The United States Green Building Council (USGBC) was founded and aims at transforming the American construction industry with a focus on green building solutions (US Green Building Council, 2008, p. 3)
- 1998: The Leadership in Energy Efficient Design (LEED) launched the first LEED project at the USGBC Membership Summit (U.S. Green Building Council, 2006, p. 11)
- 1999: The World Green Building Council (WorldGBC) was called to life by representatives from: U.S. Green Building Council; Representatives from Australia, Spain Green Building Council, United Kingdom Green Building Council, Japan Green Building Council, United Arab Emirates, Russia and Canada. The WorldGBC is an overarching body that works toward international standard of *green* building through support and the promotion of global best practice. (World Green Building Council, 2008)
- 2002: The Green Building Council of Australia (GBCA) came to life and aims to transform the property industry with green building initiatives through the design and life cycle of a building. (Green Building Council of Australia, 2009)
- 2003: Green Star Australia rating system was imple-

mented, it "...considers a broad range of practices for reducing the environmental impact of buildings and to showcase innovation in sustainable building practices, while also considering occupant health and productivity and cost savings"

- 2003: The Sustainable Building Assessment Tool (SBAT) was developed in South Africa by the CSIR. It aims at relating sustainability to third world countries through a triple bottom-line approach. Looking at a building's physical sustainability as well as making a contribution to the surrounding systems (Gibberd, 2003)
- 2005: The Sustainable sites Initiative came to life and consist of a partnership between the 'American Society of Landscape Architects' (ASLA), 'Lady Bird Johnson Wildflower Center' and United States Botanical Garden (USBG). "The Sustainable Sites Initiative was created to promote sustainable land development and management practices that can apply to sites with and without buildings..." (Sustainable Sites Initiative, 2008) The Sustainable Sites Initiative aims at being incorporated into the LEED rating system in 2009 (Sustainable Sites Initiative, 2008)
- 2007: The Green Building Council of South Africa (GBCSA) was launched "to promote and facilitate green building practices through market-based solutions." (Green Building Council of South Africa). The GBCSA was born of 'Green Building for Africa' that stems from Agenda 21 (See Earth Summit 1992) and the 'Sustainable Building Assessment Tool' SBAT through the leadership of the 'Council for Scientific and Industrial Research' (CSIR). (Van Wyk, 2009)
- 2008: Green Star South Africa (Green Star SA) launches a rating tool that is adapted from the Green Star Australia. The tool "...assesses the environmental performance of buildings on a range of issues including energy, water, materials and missions..." (South Africa: The Good News, 2008) "A lot of what we promote is just going back to the basics of good building

and design, such as orientation and using natural systems.” (South Africa: The Good News, 2008)

GREEN STAR SA

The following summary by Green Star SA (Green Building Council SA, 2008)

The objectives of Green Star SA

- Establish a common language and standard of measurement for green buildings
- Promote integrated, whole-building design
- Raise awareness of green building benefits
- Recognize environmental leadership
- Reduce the environmental impact of development

Green Star SA covers a number of categories that assess the environmental impact that is a direct consequence of a project’s site selection, design and construction.

The nine categories

(Weighting added by the author from Green Star Office - V1)

- | | |
|------------------------------|-------|
| • Management | 9% |
| • Indoor Environment Quality | 15% |
| • Energy | 25% |
| • Transport | 9% |
| • Water | 14% |
| • Materials | 13% |
| • Land Use & Ecology | 7% |
| • Emissions | 8% |
| • Innovation | bonus |

(Green Star SA, 2008)

Thus a total of more than 100% is possible.

Research was done on the contribution that each of the elements mentioned above add towards *green* design

and the elements were weighted accordingly.

Each category is subdivided into credits that make up the total value for the category. Each credit addresses an initiative that improves environmental performance.

Once all claimed credits in each category are assessed, a weighted percentage score is calculated and a four, five or six star rating is awarded.

To encourage the development and spread of innovative technologies, designs and processes that could improve buildings’ environmental performance, an ‘Innovation’ category is included in each Green Star SA rating tool. The innovation category comprise of bonus points that make up a possible score of more than a hundred percent.

Possible Green Star SA certifications

- Four Star Green Star SA Certified Rating for “Best Practice”
- Five Star Green Star SA Certified Rating for “South African Excellence”
- Six Star Green Star SA Certified Rating for “World Leadership”

Design versus As Built Certification

A Design certification may be awarded at the end of the design phase of the project. The certification is specific only to what can be demonstrated at the design stage. The intent is that the building can then be marketed as Green Star SA certified building, having demonstrated the green building strategies to be included in the building. At the end of construction, a project may be submitted and be awarded an As Built certification, verifying the procurement and implementation of green building strategies.

INVESTIGATION OF POSSIBLE APPLICATION TO LANDSCAPE ARCHITECTURE

Table 3 investigates the elements in the Current Green Star SA Office–V1 that can possibly be applied to Landscape Architecture (Green Star SA).

| Category: | Title of Credit: | Applicable points vs. category points | % applicable | Weighted % |
|--|---------------------------------------|---------------------------------------|--------------|--------------|
| Management: | | 10 / 14 | 71.5% | 6.4 % |
| | Green Star SA Accredited Professional | 2 | | |
| | Commissioning clauses | 2 | | |
| | Independent commissioning agent | 1 | | |
| | Environmental management | 2 | | |
| | Waste management | 3 | | |
| Indoor Environmental Air Quality: | | 4 / 28 | 14% | 2% |
| | External views (providing views) | 2 | | |
| | Volatile organic compounds | 2 / 3 | | |
| Energy: | | 6 / 30 | 20% | 5% |
| | Lighting power density | 4 | | |
| | Lighting zoning | 2 | | |
| Transport: | | 9 / 14 | 64% | 5.8% |
| | Provision of car parking | 2 | | |
| | Commuting mass transport | 5 | | |
| | Local connectivity | 2 | | |
| Water: | | 10 / 15 | 67% | 9% |
| | Occupant amenity water | 5 | | |
| | Water meters | 2 | | |
| | Landscape irrigation | 3 | | |

TABLE 3- GREEN STAR APPLICATION

Conclusion

Table 3 shows that, 44,2% of the rating system can be achieved through Landscape Architecture. Through studying the Sustainable Sites Initiative, this dissertation aims to distil the essence of eco-system services, to formulate aims for sustainability in Landscape Architecture that focuses on the integral role of water in all systems. The design process will devise strategies for achieving these aims for the Tshwane region. The aims that are generated could be used to evaluate the Green Star SA rating system by and could be used to identify landscape related issues

that can be addressed more thoroughly. It is however, larger than the scope of this dissertation to reformulate the Green Star SA rating system in terms of Landscape Architecture.

| | | | | |
|---|--|----------------|--------------|---|
| Materials: | | 12 / 22 | 54.5% | 7% |
| | Recycling waste storage | 2 | | |
| | Reused material | 1 | | |
| | Concrete | 3 | | |
| | PVC minimization | 1 | | |
| | Sustainable timber | 2 | | |
| | Dematerialization | 1 | | |
| | Local sourcing | 2 | | |
| Land use and ecology: | | 9 / 9 | 100% | 7% |
| | Topsoil | 1 | | |
| | Reuse of land | 2 | | |
| | Reclaimed contaminated land | 2 | | |
| | Change of ecological value | 4 | | |
| Emissions: | | 4 / 17 | 23.5% | 2% |
| | Watercourse pollution | 3 | | |
| | Light pollution | 1 | | |
| Innovation: | | 5 / 5 | | |
| | Innovative strategies and technologies | 5 | | |
| | Exceeding Green Star SA benchmark | 5 | | |
| | Environmental design initiatives | 5 | | |
| Total applicability to Landscape Architecture: | | | | 44.2% possible of all categories |

THE POSSIBLE ROLE OF LANDSCAPE ARCHITECTURE IN GREEN DESIGN

When considering the professional team for development, the Landscape Architect's responsibility includes dealing with the following components

- Water use and storm water management along with the engineering professionals
- Appropriate plant material
- 'Hardscape' materials

These basic components need to be integrated into a design system that fulfils the needs of humans whilst protecting or enhancing the environment. Figure 7 explores the possible on site components that needs to be managed. The components functions in hierarchical levels with the top levels depending on the levels below. This approach translates Landscape Architecture into a management of resources on many levels and in specific ways to reach a the envisaged design intent.

The author is of the opinion that through a dedicated green measuring tool for Landscape Architecture (along with strategies for achieving them) the sustainability of Landscape Architecture can be demystified and made measurable. The author will not however attempt to propose a *green* rating tool for Landscape Architecture or amend Green Star SA.

Why reformulation is needed

It is the perception of the author that Green Star SA has a fragmented approach to evaluating projects. Although some of the criteria focuses on specific systems, for example Water (WAT – 3): Landscape Irrigation (Green Star SA), a check list approach seems to be followed and certain aspects can be chosen in isolation.

All sites are made up of physical, bio-physical and cultural systems. The designer needs to understand the specific on site systems in order to develop both with and alongside them. The essence of systems is organization and hierarchy with homologies, not superficial analogies. Von Bertalanffy (1971, p. 7) states that :

“... the only way to study organization is to study it as a system; ...treating organization as a system of mutually dependant variables.”

The study will investigate systems that are applicable to Landscape Architecture in South Africa, with a specific focus on the City of Tshwane Metropolitan Municipality. Figure 7 illustrates the approach of the author to on site systems.

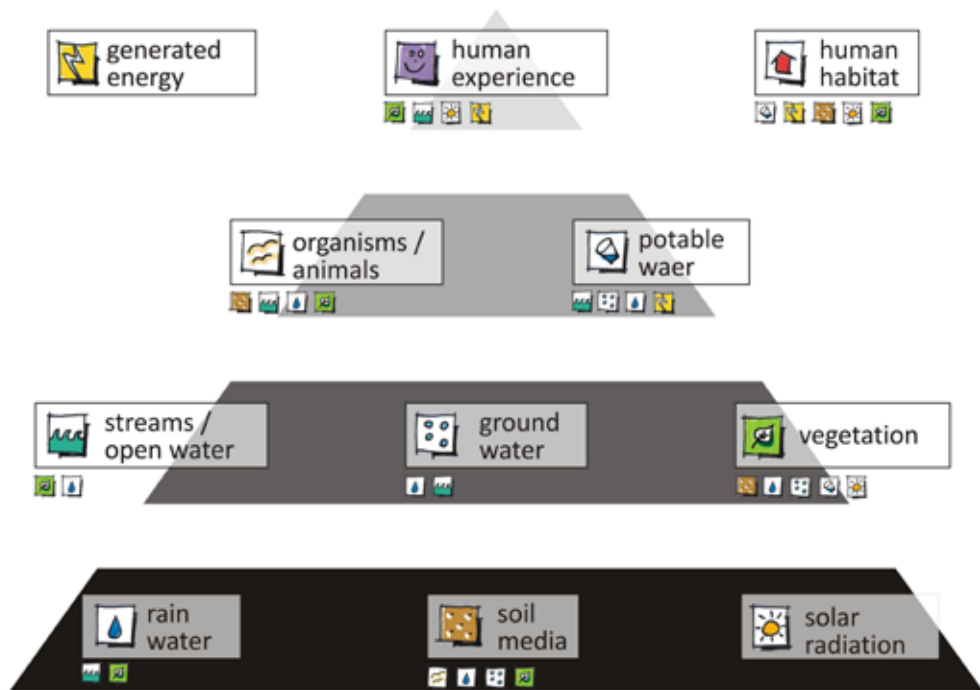


FIGURE 7. ON SITE SYSTEMS - EACH LEVEL DEPENDS ON THE LEVEL BELOW TO BE SUSTAINED