

# Green buildings: key considerations and opportunities for Government's infrastructure programmes

Jeremy Gibberd

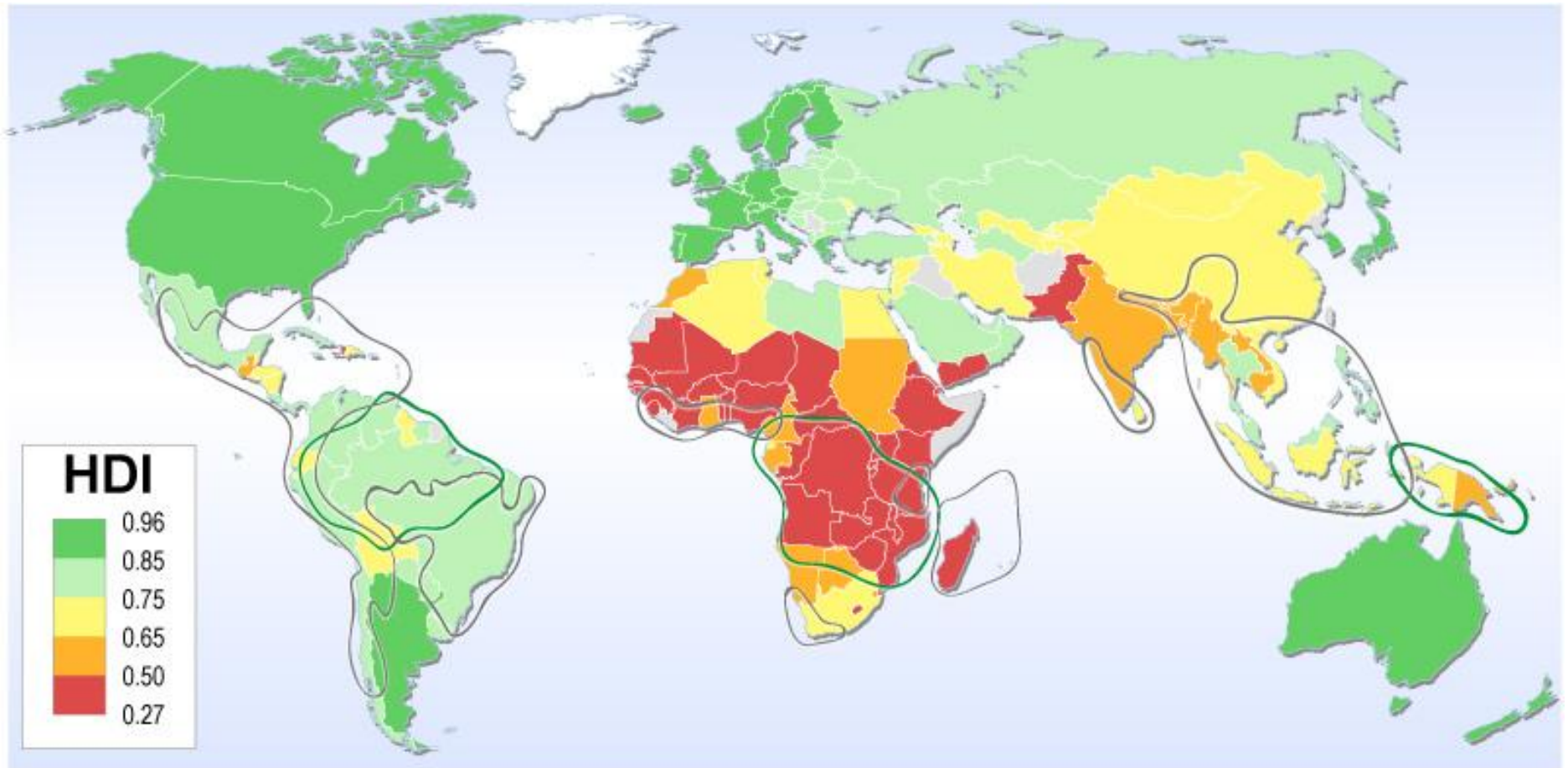
19 September 2011





# Structure

- Context
- Considerations
- Opportunities
- Recommendations

# Human Development Index and Biodiversity

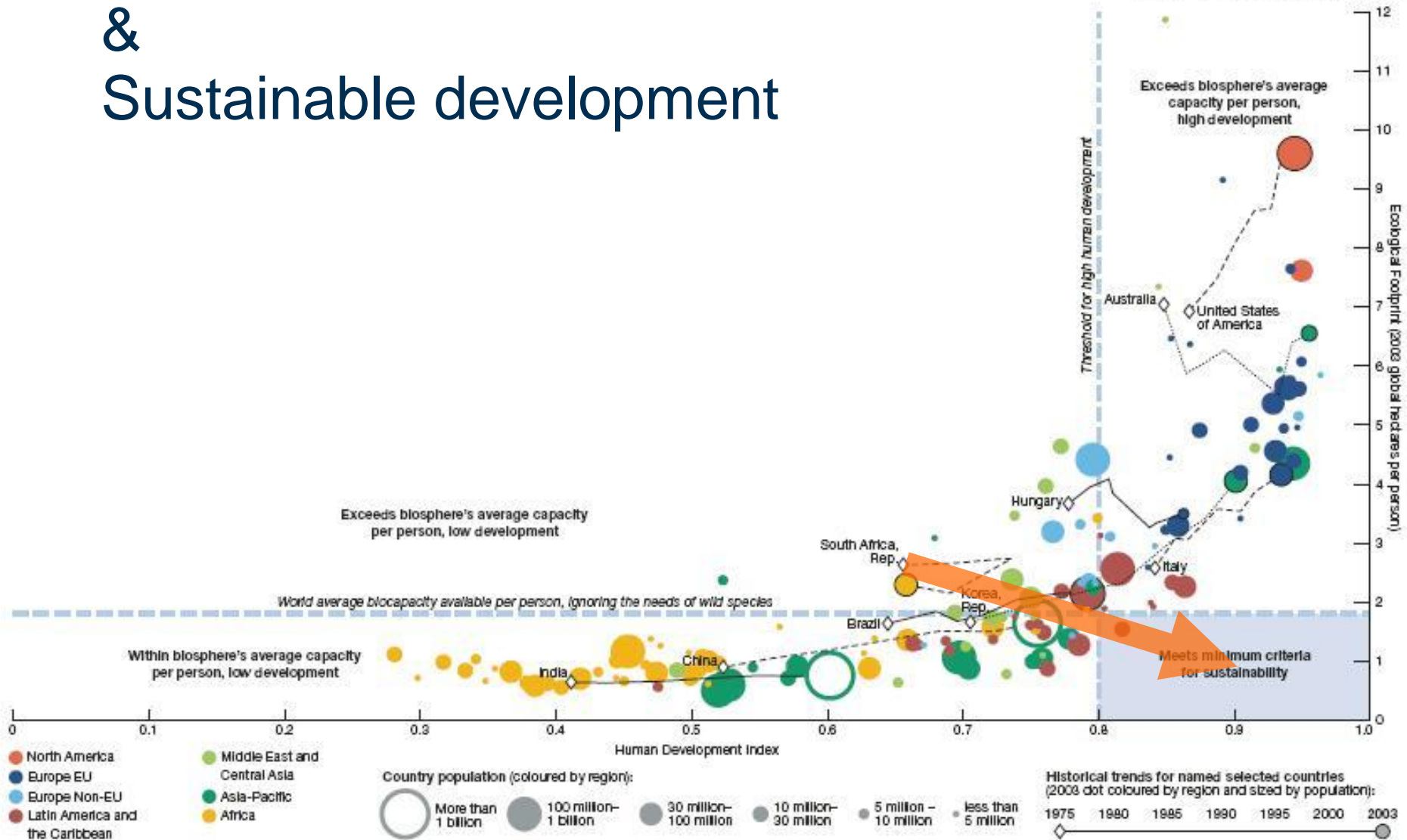


 Selected terrestrial biodiversity hotspots

 Selected major wilderness areas

# Defining Sustainability & Sustainable development

Fig. 22: HUMAN DEVELOPMENT AND ECOLOGICAL FOOTPRINTS, 2003



# Context: South Africa's MTSF Strategic Priorities and Millennium Development

Linkage between South Africa's national development planning and the MDGs		
MTSF STRATEGIC ELEMENTS		RELEVANT MDGS
1.	Strategic Priority 1: Speeding up growth and transforming the economy to create decent work and sustainable livelihoods	MDG 1, MDG 2, MDG 3, MDG 8
2.	Strategic Priority 2: Massive programme to build economic and social infrastructure	MDG 1, MDG 3, MDG 8
3.	Strategic Priority 3: Comprehensive rural development strategy linked to land and agrarian reform and food security	MDG 1, MDG 2, MDG 7
4.	Strategic Priority 4: Strengthen the skills and human resource base	MDG 2
5.	Strategic Priority 5: Improve the health profile of all South Africans	MDG 4, MDG 5, MDG 6
6.	Strategic Priority 6: Intensify the fight against crime and corruption	MDG 2, MDG 3
7.	Strategic Priority 7: Build cohesive, caring and sustainable communities	MDG 2, MDG 3, MDG 7
8.	Strategic Priority 8: Pursuing African advancement and enhanced international cooperation	MDG 8
9.	Strategic Priority 9: Sustainable resource management and use	MDG 2, MDG 3, MDG 7
10.	Strategic Priority 10: Building a developmental state, including improvement of public services and strengthening democratic institutions	MDG 1, MDG 2, MDG 3, MDG 8

# Green building performance indicators

Environmental Criteria	Building Criteria	Building Indicators
Energy	<ul style="list-style-type: none"> <li>• Greenhouse gas emissions</li> <li>• Lighting power densities</li> </ul>	<ul style="list-style-type: none"> <li>• kgCO<sub>2</sub>/m<sup>2</sup>/year</li> <li>• W/m<sup>2</sup></li> </ul>
Water	<ul style="list-style-type: none"> <li>• Potable water consumption</li> </ul>	<ul style="list-style-type: none"> <li>• L/m<sup>2</sup>/d</li> </ul>
Indoor environmental quality	<ul style="list-style-type: none"> <li>• Ventilation rates</li> <li>• Electric lighting levels</li> <li>• Individual comfort control</li> <li>• Daylight</li> </ul>	<ul style="list-style-type: none"> <li>• L/s/p</li> <li>• Lux</li> <li>• area (m<sup>2</sup>) per control</li> <li>• Daylight factor (%)</li> </ul>
Land	<ul style="list-style-type: none"> <li>• Topsoil</li> </ul>	<ul style="list-style-type: none"> <li>• % retained and reused</li> </ul>
Materials	<ul style="list-style-type: none"> <li>• Recycling</li> </ul>	<ul style="list-style-type: none"> <li>• % recycled content</li> </ul>
Transport	<ul style="list-style-type: none"> <li>• Public transport</li> </ul>	<ul style="list-style-type: none"> <li>• Distance (m<sup>2</sup>), frequency (minutes)</li> </ul>

# Ecological Footprint – Building implications

HDI Criteria	Building Criteria	Building Indicators
Food	<ul style="list-style-type: none"> <li>• Production</li> <li>• Consumption</li> </ul>	<ul style="list-style-type: none"> <li>• kg/m<sup>2</sup>, distance to consumption (km)</li> <li>• local sourced, % vegetarian,</li> </ul>
Shelter	<ul style="list-style-type: none"> <li>• Utilisation, materials</li> <li>• Energy</li> </ul>	<ul style="list-style-type: none"> <li>• Area per person (m<sup>2</sup>)</li> <li>• Energy consumption</li> </ul>
Mobility	<ul style="list-style-type: none"> <li>• Public transport</li> <li>• Cycling, walking</li> <li>• Air, train travel</li> </ul>	<ul style="list-style-type: none"> <li>• Public transport facilities, distance</li> <li>• Pedestrian facilities, distance</li> <li>• Communication technology</li> </ul>
Goods	<ul style="list-style-type: none"> <li>• Waste</li> <li>• Consumables</li> </ul>	<ul style="list-style-type: none"> <li>• Amount produced, % recycled</li> <li>• Amount, Energy content</li> </ul>
Services	<ul style="list-style-type: none"> <li>• Entertainment, leisure</li> <li>• Insurance</li> </ul>	<ul style="list-style-type: none"> <li>• Local provision, diversity</li> <li>• Building quality</li> </ul>

# Human Development Index – building implications

HDI Criteria	Building Criteria	Building Indicators
A long and healthy life	<ul style="list-style-type: none"> <li>• Health facilities</li> <li>• Shared access</li> <li>• Healthy food</li> </ul>	<ul style="list-style-type: none"> <li>• Facilities (information, equipment) and area (m2)</li> <li>• Person hours per week</li> <li>• Type, availability, affordability</li> </ul>
Knowledge	<ul style="list-style-type: none"> <li>• Education</li> <li>• Shared access</li> <li>• Construction, facilities training</li> <li>• Building knowledge</li> </ul>	<ul style="list-style-type: none"> <li>• Facilities (information, equipment) and area (m2)</li> <li>• Person hours per week</li> <li>• % of working hours available for education, % credit improvement</li> <li>• Building user manual</li> </ul>
A decent standard of living	<ul style="list-style-type: none"> <li>• Construction / operational labour intensity</li> <li>• Small enterprise support</li> <li>• Inclusion</li> </ul>	<ul style="list-style-type: none"> <li>• Person yrs/construction budget</li> <li>• People employed / m2 of building</li> <li>• Number of enterprises supported</li> <li>• Gender parity, environmental access</li> </ul>



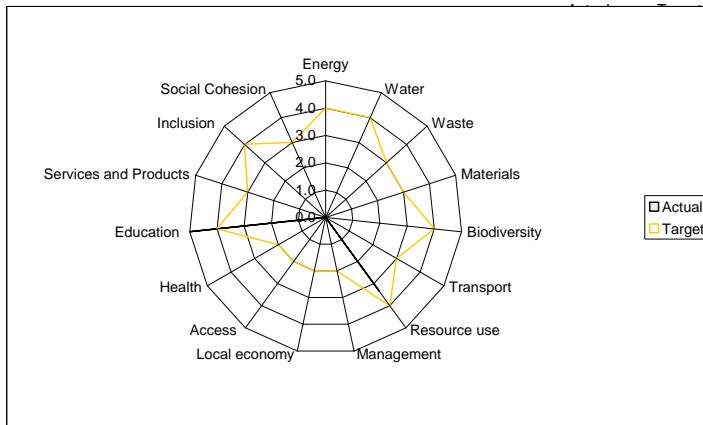
# Sustainable Building Assessment Tool (SBAT)

## SBAT Light Industrial - Design v.108

**Project**

**Address**

### SBAT Chart



Environmental, Social and Economic Performance	Score	Performance
Environmental	0.0	Red
Economic	0.7	Orange
Social	1.0	Yellow
<b>Overall performance</b>	<b>0.6</b>	<b>Orange</b>

EF and HDI Factors	Score	Performance
EF Factor	0.5	Orange
HDI Factor	1.3	Yellow

Target Compliance	%	Performance
Environmental	-100	Red
Economic	-74	Orange
Social	-69	Yellow
<b>Overall compliance</b>	<b>-82</b>	<b>Yellow</b>

**Self Assessment:** Information supplied and confirmed by  
**Self Assessment by:**  Date   
**Signature**

**Validation:** Documentation checked and validated by  
**Validation by:**  Date   
**Signature**

## SBAT Light Industrial - Design v.108

EN Energy	Achieved
	<b>0.0</b>

**Objective**  
 The building is energy efficient and uses renewable energy

Indicators	Potential	Achieved
<b>EN1 Orientation</b> Building is orientated within 15 degrees of North 60-79% of useable area has a daylight factor of at least 2%	4 2	0
<b>EN1 Insulation</b> 80 - 100 % of useable area has a daylight factor of at least 2% 60-79% of useable area has a daylight factor of at least 2%	4 2	0
Where over 60% of useable area has a daylight factor of over 2%, daylight switching has been included.	1	0
<b>EN2 Daylight Switching</b> Where over 60% of useable area has a daylight factor of over 2%, daylight switching has been included.	1	0
<b>EN3 Internal lighting power density</b> Internal lighting power density is under 10W/m2 Internal lighting power density is under 15W/m2	2 1	0
<b>EN4 Movement sensors</b> Over 80% of internal lighting is linked to movement sensors	2	0
<b>EN5 External lighting</b> 80% or more of external lighting is linked to movement sensors and a day/night switch	1	0
<b>EN6 Solar water heating</b> All water heating requirements met through solar power	1	0
<b>EN7 Heating, Cooling and Ventilation</b> Heating, cooling & ventilation power density is under 5W/m2 Heating, cooling & ventilation power density is under 10W/m2	2 1	0
<b>EN8 Heating, Cooling and Ventilation Controls</b> Heating, cooling and ventilation controls are linked to motion sensors or timers.	1	0
<b>EN9 Renewable Energy Generation</b> 25W of renewable energy area generated per m2 of useable area 20W of renewable energy area generated per m2 of useable area 15W of renewable energy area generated per m2 of useable area 10W of renewable energy area generated per m2 of useable area 5W of renewable energy area generated per m2 of useable area	10 8 6 4 2	

# Sustainable Development Criteria for the Built Environment



- Land Use and Integrated Development
- Biodiversity
- Agriculture and Landscaping
- Water, Sewage and Storm water Runoff
- Materials and Construction
- Energy, Mechanical and Electrical Systems
- Waste and Pollution
- Local Economic Development:
- Transport and Routes
- Health and Well Being
- Education and Ongoing Learning
- Housing
- Inclusion and Social Cohesion
- Management and Monitoring

# Sustainable Development Criteria for Projects requiring EIAs

## LU Land Use and Integrated Development

### Objectives

Development should be integrated with existing and planned infrastructure and land uses to ensure efficient systems and balanced use of land.

### Questions

The following questions provide a guide to the key issues related to land use and integrated development that should be addressed in development proposals.

- Will the development change current land uses on the site? How will this change?
- Is the development in line with Environmental Management Frameworks, Spatial Development Frameworks and Growth and development Strategies?
- How will the development affect local service infrastructure such as roads, electricity, water and waste? Is there sufficient capacity to accommodate the development in existing or planned service infrastructure?
- How will the development affect local transportation patterns? Is there sufficient capacity to accommodate the development in existing or planned public transport systems?

### Data

Completing the table below enables quantified data on land use to be presented. It also provides an indication of the impact and performance of the proposed development in terms of land use and integrated development.

Land use categories*	Existing site	Proposed development	Difference (units)	Difference (%)
Subsidy or affordable housing (m <sup>2</sup> )				
Other residential (m <sup>2</sup> )				
Business (m <sup>2</sup> )				
Industrial (m <sup>2</sup> )				
Education, community or institutional purposes (m <sup>2</sup> )				
Recreation (m <sup>2</sup> )				
Mining (m <sup>2</sup> )				
Transport (m <sup>2</sup> )				
Service infrastructure (m <sup>2</sup> )				
Open space (m <sup>2</sup> )				
Private open space (m <sup>2</sup> )				
Agriculture (m <sup>2</sup> )				
Total site area (m <sup>2</sup> )				
<b>Land use Indicators</b>				
Percentage of the site used for residential purposes (%)				
Percentage of the site used for education, community or institutional purposes (%)				
Percentage of the site that is open space (%)				
Percentage of site used for agriculture (%)				

\* Definitions for the above land uses are provided in the definitions section at the front of the document

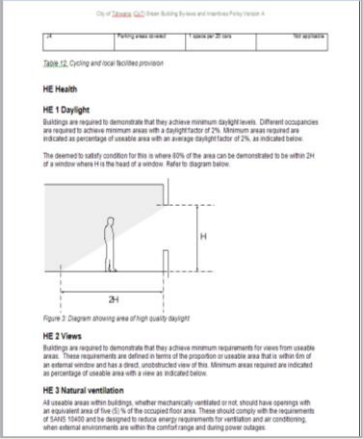
### Reference

- National Environmental Management Act (Act 107 of 1996, as amended), Chapter 1, Section 2 (2)
- Gauteng Planning and Development Act, 2003 (Act 3 of 2003)

- **Sustainable development objectives**
- **Development questions**
- **Data: *Relative* performance of existing and proposed development (what quantified improvement will occur?)**
- **Sustainable development criteria: Will the development achieve specific targets?**

# Green Building bylaws and incentive schemes

## Green building development policy



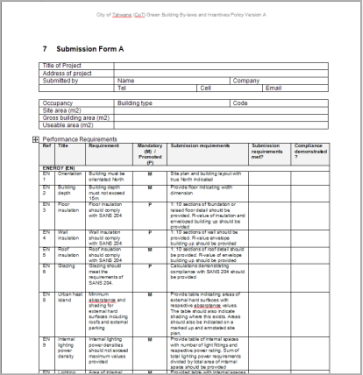
## Compliance verification



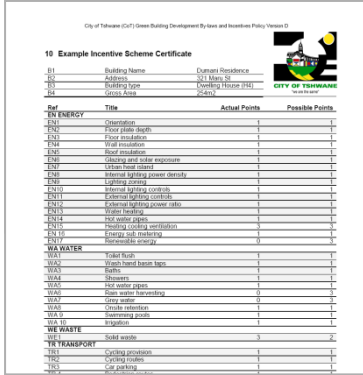
Develop

- Simple cost effective measures inc:
- Water efficient fittings, maximum lighting power density

## Submission forms



## Green building development incentive scheme



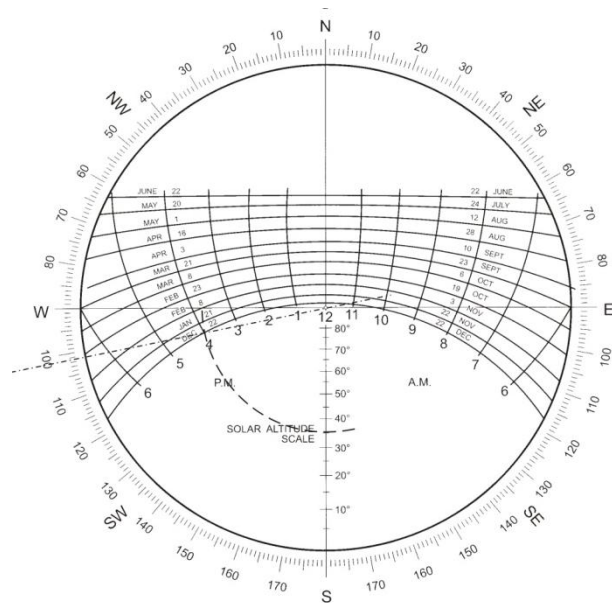
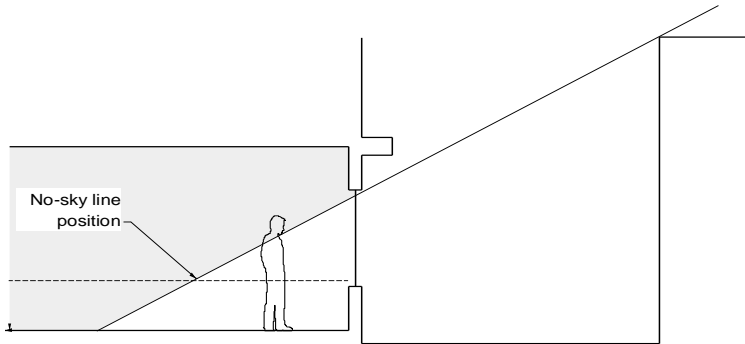
Develop



- Easy to achieve
- Easy to assess and approve



# CoJ Design Guidelines for Energy Efficiency



- Integrated design
- Human comfort & health
- Climate
- Design strategies
- Site
- Form and envelope
- Internal space
- Mechanical systems
- Lighting
- Water heating
- Appliances and equipment
- Controls and monitoring
- Benchmarks

# Clinic Design Assessment Protocol for Airborne Infection Control



1



9



17



25



# Thuba Makote Schools as Centres for Community Development



## INTRODUCTION AND BACKGROUND

The Thuba Makote programme of the National Department of Education aims to pilot new approaches to school building design, construction and operation through the development of nine provincial pilot projects. Implementation has followed a highly interactive process that actively involves a range of stakeholders including provincial departments, local communities, business and NGOs.

The project explores how schools can become centres for community development. Opportunities are used in the design, construction and management of the schools to enable them not only provide good education for children but also cater for community needs and development. A key objective is to achieve maximum impact, cost effectively and rapidly while ensuring that interventions made are sustainable and appropriate.



## AIMS AND OBJECTIVES

The project aims to address the need for high quality school education & community development in poverty-stricken areas. It investigates how the design, construction & management of schools can be developed to support cost-effective high quality school education, while supporting community development through capacity building, employment creation & access to educational & standard-use facilities such as food gardens, workshops and learning resource centres.

The primary aims of the pilot projects are:

1. To address poverty relief and community development
2. To ensure sustainability
3. To explore innovative educational building design and management
4. To support and encourage community participation in the process

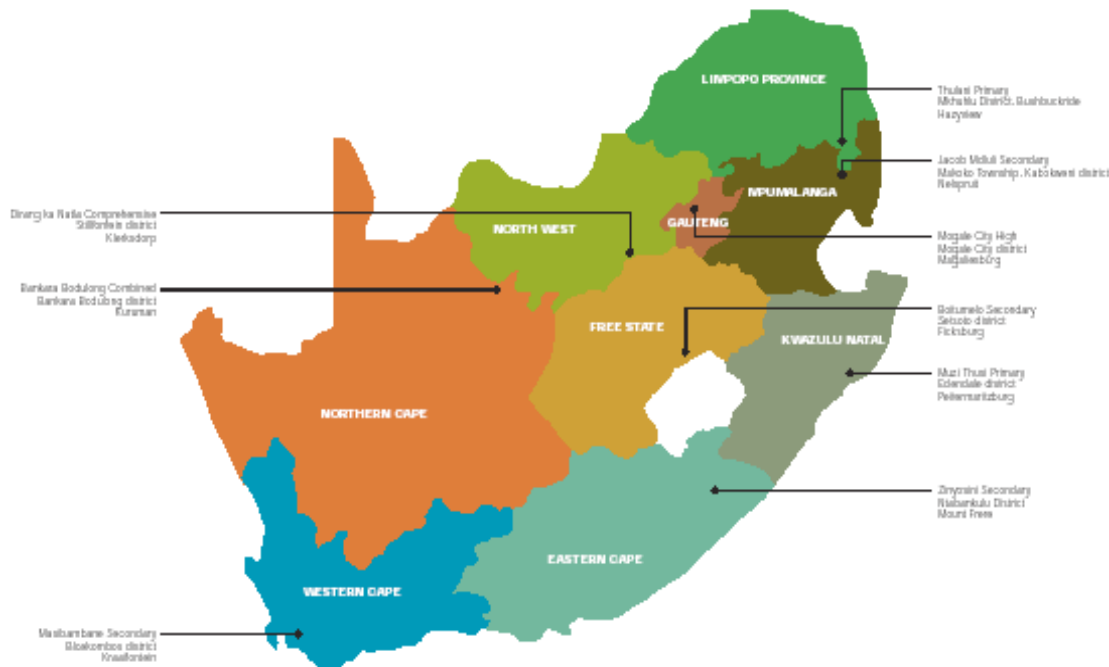


## SOLE PLAYERS AND STAKEHOLDERS

Four key role players involved in the development of the pilot projects are:

- The Provincial Departments of Education, to liaise with and involve other provincial government departments. The Provincial Departments of Education will adopt the pilot schools upon completion.
- The National Team led by the CSIR, to manage and implement the program on behalf of the National Department of Education.
- Provincial multidisciplinary consultative 'Site Teams', appointed by the CSIR to implement and manage the pilot projects while ensuring that all project aims and objectives are met.
- Local communities, through the establishment of School Task Teams, to liaise with the local community and assist in providing labour for the construction of the pilot projects.

In addition, local businesses, NGOs, donor agencies and provincial and local Government Departments have been involved where necessary.

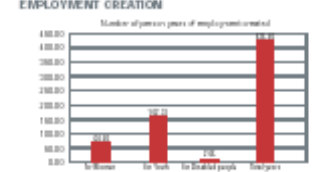


## INFRASTRUCTURE CREATED

Type of Facility	Area (m <sup>2</sup> )
Classrooms	6,110.00
Food Production	6,004.00
Learning Resource Centres	14,110.00
Community and School Halls	1,171.00
School Administration Facilities	965.00
Small Business Support	412.00
Laboratories and Workshops	1,000.00
<b>Total New Infrastructure Created</b>	<b>12,967.00</b>
Investment in Learning Infrastructure	7,126.72



## EMPLOYMENT CREATION



## OUTCOMES AND FINDINGS

As part of the design, construction and management of nine pilot schools a range of innovative approaches were investigated. These explored the relationship between the school building and construction, education and community development.

The pilots demonstrated that significant community development impact could be achieved through school building programmes. In particular the programme suggested that local capacity development, SME support and job creation could be strongly supported if this was addressed at a specific objective.

The pilots also demonstrated how buildings could be designed and managed to effectively accommodate and support new technological developments such as ICT, changed curricula, and government policy. This aspect will be explored further through analysis of the schools facilities in use.





# Thuba Makote

- 9,000 learners access to school, access for 1,000 other learners (adult)
- 540 person years employment created, 20-50% women, 30% youth, 2-5% people with disabilities
- 180,000 hours training: construction, SGB, M&M, SMME dev, agric
- 36 sustainable development projects : gardens, learning resource centres, workshops, construction products
- 9 Schools, R48million
- *Positive social, economic and environmental changes can be achieved in large-scale built environment projects cost effectively*



# Thuba Makote Schools as Centres for Community Development



## PROJECT INITIATION STAGES

**Site Analysis** - Capture the needs, opportunities and existing resources regarding the site, context and community in order to develop an in-depth understanding of the local context. Ensure that the Site Team and School Task Teams are fully briefed on the project and understand the budget, programme and outputs required for the project.

**Brief Development** - Identification of needs and priorities to develop a detailed description of the outputs to be achieved within the project and the method by which these will be achieved.

**Target Setting** - Setting targets related to place, project aims & objectives which quantitatively describe a range of targets to be met at each of the different villages of the project. Preliminary planning & identification of community development programmes.



## DESIGN DEVELOPMENT STAGES

**Concept Design** - Preliminary development of preliminary conceptual designs for facilities and projects described in the brief which aim to address targets set in the target setting stage of the project.

**Detailed Design** - Further development and finalisation of conceptual design into detailed design. Preliminary production of tender documentation. Ongoing identification and development of community development programmes, through consultation and discussion with the school and community.

**Tender Documentation** - Further preparation and finalisation of tender documentation & call for tenders for the construction of the facilities. Implementation of preliminary stages of appropriate community development programmes.



## IMPLEMENTATION STAGES

**Tender Adjudication** - Development of tender adjudication criteria in line with the aims and objectives of the project. Adjudication of tenders received & final appointment of contractor for construction work.

**Project Implementation** - Construction of facilities as per tender documentation and aims and objectives of the project. Procurement of furniture and equipment and implementation of community development programmes.

**Handover** - Completion and formal handover of school, supplemented by capacity building in operation, maintenance and management. Evaluation of budgets and contracts & data collection. Preliminary evaluation of project information and completion of final reports.

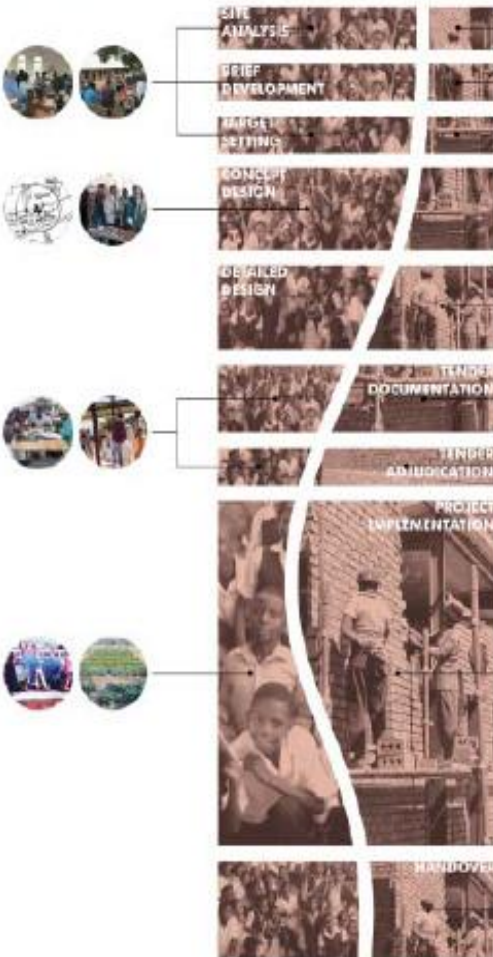
## COMMUNITY

Detailed brief developed through participative workshops with Communities and interested and documents with local people.

Interactive design development with communities and school. Discussions facilitated through school visits, models and diagrams.

Two stage tender process with early workshops to explain tender documentation to potential contractors. Contractors who fulfil initial requirements shortlisted.

Community development projects and training related to construction run in parallel and coordinated with building project.



## BUILDING

Site analysis involving demographic and educational analysis of the local area. Profile of projected requirements developed.

Technical analysis and development of proposed concept designs including area analysis, environmental context, O&M support and value for money.

Transparent, explicit technical tender adjudication process. Tender adjudication and award explained in detail in tender meeting with key stakeholders present.

Construction undertaken by awarded contractors. Emphasis on the employment of local people, women and disabled people. Training provided where possible.

Handover process where principal school governing body, task force and full-time village role facilities and their maintenance requirements explained to them.



## PROJECT INITIATION OUTPUTS

**Site Analysis** - Research for and completion of site analysis reports. Community meetings and declaration of participatory process.

**Brief Development** - Brief development reports, list of needs and priorities for facilities, furniture and equipment required, preliminary tender plan for the school facility.

**Target Setting** - Target setting reports, community development plans and programmes.

This stage aimed to develop a clear picture of the needs and opportunities at the school and with the local community. The information was developed into clear reports that provided an explicit framework to help ensure that high performance, responsive solutions were developed.



## DESIGN DEVELOPMENT OUTPUTS

**Concept Design** - Concept design reports and preliminary models for discussion with community.

**Detailed Design** - Detailed design report, detailed design drawings and models.

**Tender Documentation** - Tender documentation, final construction drawings and preliminary business plans for community development components.

This stage designed solutions to the brief developed. It is order to review these solutions were tested and discussed with key stakeholders (through for instance 3 dimensional models) and against specific performance criteria (for instance areas of construction, maintenance and value for money).



## IMPLEMENTATION OUTPUTS

**Tender Adjudication** - Tender adjudication reports & contract documentation.

**Project Implementation** - School facilities, Monthly reports and community development programme outcomes e.g. food gardens, formalised partnerships.

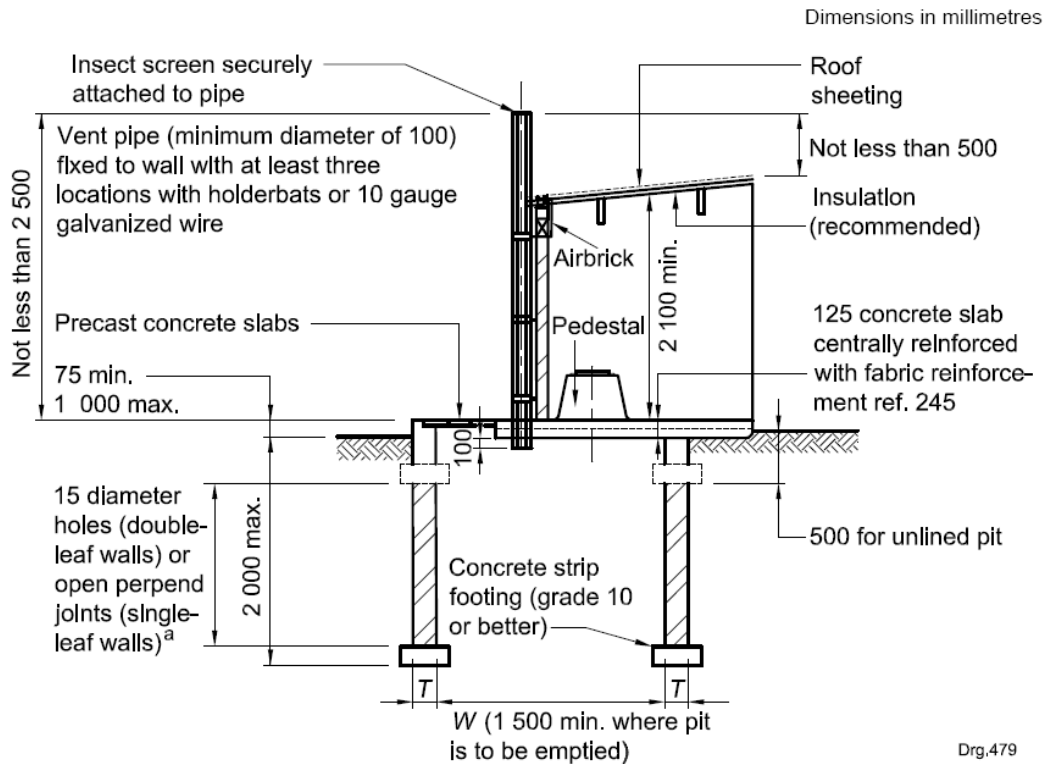
**Handover** - Completed, operational school facilities, building user manuals, furniture and equipment, final practical reports. During this stage the project was implemented.

During this stage both physical outputs such as buildings, gardens and related infrastructure and non-physical outputs (outcomes) were developed such as organisational structures and administrative systems designed to manage facilities such as the hall, workshop and learning resource centres so that these could be used on a shared basis with the community.






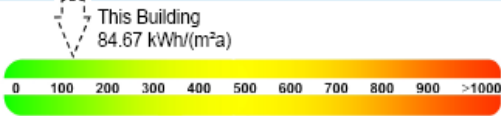
# Part Q: Non-water-borne means of sanitary disposal

SANS 10400-Q:2011  
Edition 3



- Revised regulations welcome **BUT:**
- Need to be simpler and shorter
- Needs to be based on local based research
- Need to support sustainable technologies alternative materials, grey water
- .

# Enerkey Performance Certificate (Fraunhofer Institute)

 <b>EnerKey Performance Certificate</b> 	
Project: Civic Centre Johannesburg	Valid until: Jan 2011
<b>Building</b> Address: Civic Centre 158 Loveday Str Braamfontein Johannesburg	
Occupant/Owner: City Council Johannesburg	
	
<b>Energy Consumption (Final Energy) in kWh/(m<sup>2</sup>a)</b> This Building 84.67 kWh/(m <sup>2</sup> a)	
	
Reference Values:	New Building 200.00 kWh/(m <sup>2</sup> a) Retrofitted Building 280.00 kWh/(m <sup>2</sup> a)
The Consumption includes the energy share for: <input checked="" type="checkbox"/> Heating <input checked="" type="checkbox"/> Cooling <input checked="" type="checkbox"/> DHW <input checked="" type="checkbox"/> Lighting <input checked="" type="checkbox"/> Appliances <input type="checkbox"/> Other	
Building Type	Offices
Year of construction:	1878
Useable floor area:	55,000.00 m <sup>2</sup>
Reference Values according to:	SANS 204-1
Climatic Zone:	Cold interior (Johannesburg, Bloemfontein)
Created With	EnerKey Advisor Version 0.9.0.0
Issuer: EnerKey Module 3	1/26/2010 (Simon Woessner) Date Signature Issuer

- Energy performance certificates
- Water performance certificates
- Recycling performance certificates
- SMME, labour intensity certificates
- Training, investors in people reporting

# Recommendations

## 1. Sustainable development objectives and criteria

- Integrate environmental, social and economic performance requirements
- Align with good practice and government policy

## 2. Mandatory minimum standards for planning and buildings

- Key considerations: cost effective, high impact, quality of life
- Prescriptive (mainly) standards, easy to implement measures

## 3. Systems and capacity

- Simple, effective checklists, guidance and training
- Clear allocation of responsibility

## 4. Ongoing improvement

- Reporting, support



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## THE GREEN BUILDING COUNCIL OF SOUTH AFRICA

The GBCSA is an independent, non-profit, membership-based organisation that was formed in 2007 by leaders from all sectors of the commercial property industry. We are a full member of the World Green Building Council and the official certification body of buildings under the Green Star SA Rating System. We aim to ensure that all buildings are built and operated in an environmentally sustainable way so that all South African's work and live in healthy, effective and productive environments.

### What is a green building?

A green building is a building which is energy efficient, resource efficient and environmentally responsible - it incorporates design, construction and operational practices that significantly reduce or eliminate the negative impact of development on the environment and occupants.



SUBSCRIBE



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Multi Unit Residential PILOT

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GREEN BUILDING COUNCIL  
OF SOUTH AFRICA

NEW! READ MORE

Office v1

★ ★ ★ ★ ★ ★

GREEN BUILDING COUNCIL  
OF SOUTH AFRICA

READ MORE

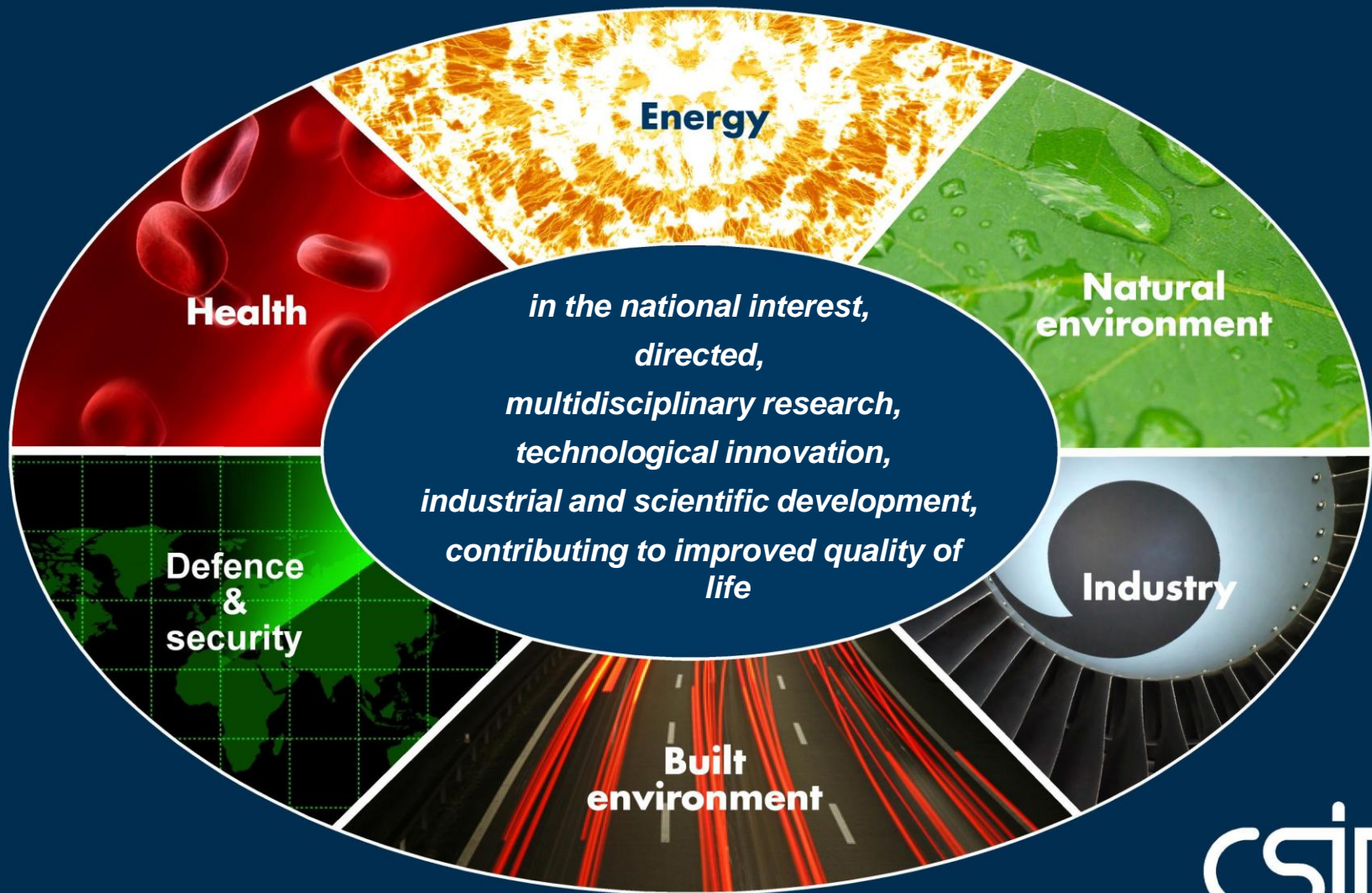
Retail Centre v1

★ ★ ★ ★ ★ ★

GREEN BUILDING COUNCIL  
OF SOUTH AFRICA

READ MORE

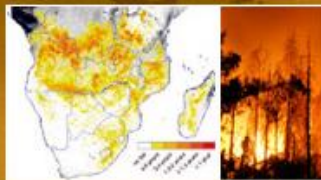
# CSIR research impact areas



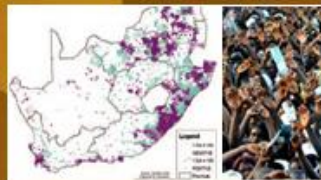
# South African Risk & Vulnerability Atlas

## SA RISK AND VULNERABILITY ATLAS

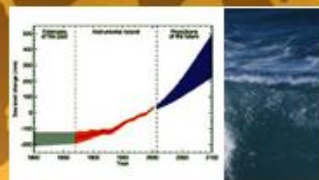
Equipping decision-makers with information on the impact and risk of global change in the region



Fire return period



Population growth



Sea level increase



Temperature increase



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About us

Introduction to the Initiative

Case studies

Workshops and events

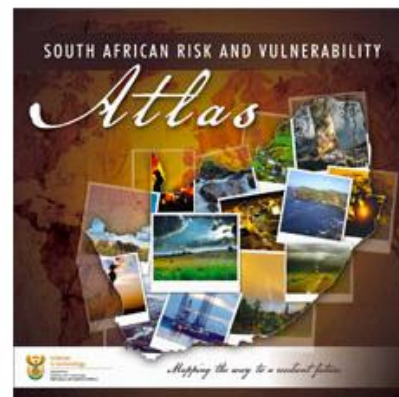
Media room

e-Newsletter

Useful links

Contact us

The South African Risk and Vulnerability Atlas - a new atlas of local risk and vulnerability in the context of global environmental change - will be further rolled out in 2011. The Atlas is aimed at equipping decision-makers with information on the impact and risk associated with global change in the region.



### eNewsletter

Read the [June 2011](#) issue now! Be sure to [subscribe](#) to receive future copies via email.

### Websites to visit

[Kruger to Canyons \(K2C\)](#)  
[Climate Change Studies](#)

[SADC Climate Risk Capacity Building](#)

### Electronic Spatial Database

[Access](#) the latest research findings, data, maps and case studies on global change risk and vulnerability.

