SPORT AS A GENERATOR FOR NATION BUILDING, URBAN REVITALISATION AND A MEANINGFUL ARCHITECTURE:

TOWARDS THE DESIGN OF AN URBAN FRAMEWORK AND HIGH PERFORMANCE CENTRE FOR THE KINGS PARK PRECINCT, DURBAN.

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A DISSERTATION SUBMITTED TO THE SCHOOL OF ARCHITECTURE, HOUSING AND PLANNING – UNIVERSITY OF KWAZULU-NATAL, HOWARD COLLEGE CAMPUS, IN PARTIAL FULFILMENT TOWARDS THE DEGREE OF MASTER OF ARCHITECTURE.

MARCH 2010

DECLARATION

Submitted in partial fulfilment of the requirements for the degree of Masters of Architecture, in the Graduate Programme in Howard College, University of KwaZulu-Natal, South Africa.

I declare, that this dissertation is my own unaided work. All citations, references and borrowed ideas have been duly acknowledged. I confirm that an external editor was not used. It is being submitted for the degree of Masters of Architecture in the Faculty of Humanities, Development and Social Sciences, University of KwaZulu-Natal, South Africa. None of the presented work has been submitted previously for any degree or examination in any other University.

Ryan Harborth

March 2011

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ABBREVIATIONS

ANC	African National Congress
CBD	Central Business District
CFD	Computational Fluid Dynamics
DSR	Department of Sport and Recreation
EDAW	Eckbo, Dean, Austin and Williams
FIFA	Fédération Internationale de Football Association
GDP	Gross Domestic Product
GSHP	Ground Source Heat Pump
HPC	High Performance Centre
IOC	International Olympic Comity
IW	Intelligent Workplace
ISR	Institute for Sport Research
KZN	KwaZulu-Natal
RDP	Reconstruction and Development Programme
RWC	Rugby World Cup
SSISA	Sport Science Institute of South Africa
SSMU	Sport Science & Medical Unit
SWOT	Strengths, Weaknesses, Opportunities & Threats
TUKS	Transvaalse Universiteits-Kollege
UCT	University of Cape Town
UKZN	University of KwaZulu-Natal
WPRFU	Western Province Rugby Football Union

GLOSSARY OF TERMS

Bioclimatic Design: The design of buildings and spaces based on local climate, aimed at providing thermal and visual comfort, making use of solar energy and other environmental sources. Basic elements of bioclimatic design are passive solar systems and utilising environmental sources (for example, sun, air, wind, vegetation, water, soil, sky) for heating, cooling and lighting the buildings.

Biointegration: The integration of artificial human-made systems (built environment) with its host organism (natural environment).

Biomass: Any organic (wood, agricultural or vegetative) matter.

Biomimesis: Designing or learning by imitating nature.

Brownfield Site: Property that is no longer used for its original purpose and may be contaminated.

Cultural Mobility: Places where people with different cultures and lifestyles can meet and share new experiences - spaces where a change of perception is possible (Foster, 2008: 68).

Eco-Design: or Ecological Design is environmentally-conscious design which uses ecological design principles and strategies to design our built environment so that they integrate benignly and seamlessly with the natural environment.

Ecology: The study of the relationship between living things and their environment.

Ecomimesis: Designing using analogies of ecosystems and ecology.

Environmentally Sustainable: Cross-generational maintenance of ecosystem components and functions.

Evaporative Cooling: The phase change of water from liquid to gas is a heat absorbing process. The result is effective cooling of the air as water evaporates.

Green Roof: Vegetation cover on roof surfaces.

Green Walls: Vegetation cover on wall surfaces.

Grey Water: Non-drinkable water that can be reused for irrigation, flushing toilets, and other purposes. This does not include human waste.

Heat Pump: A thermodynamic device that transfers heat for one medium to another.

Heat Recovery: Heat utilized that would otherwise be wasted. Sources of heat include machines, lights, process energy and people.

Indigenous: Native to a region.

Metonymic Relationships: Where individual bodies stand in for the collective community.

Sick Building Syndrome: A pattern of health complaints related to poor indoor air quality.

Sport-Scape: An area focused toward sport and recreation in a region.

Sustainability: The ability to support, endure, or keep up. Meeting present needs without compromising future resources.

Urban Revitalization: A comprehensive and integrated vision and action which leads to the resolution of urban problems and which seeks to bring about a lasting improvement in the economic, physical, social and environmental condition of an area that has been subject to change.

FORWARD

The decision-making process in selecting a thesis topic can be difficult when considering the wide variety of topics that architectural students are exposed to during their education. So many projects or ideologies over the course of a six year time period are worth further study and evaluation. How then did I arrive at this thesis topic?

Having been born in Durban, South Africa, and being an avid sports fan and athlete, the combination of architecture and sports has been something that I have desired to study as it is a matter that affects me personally. By combining two important aspects of my life into a thesis, a road was paved allowing me to learn more and investigate deeper into the topic than would have been otherwise possible. Furthermore, the subject matter is interesting, and provides rewarding experiences both academically and personally.

ABSTRACT

The purpose of this thesis is to determine the significance of sport in society and its influence on the urban fabric and architecture. The project investigates the relationship between the built form and sport in the design of an urban framework and High Performance Centre for Kings Park, Durban. More specifically, the investigation has three primary objectives, ranging from the macro to the micro context or from the broad to the more specific, (Social, Urban and Architectural). The first aim will explore the social aspects of sport and its influence on culture, specifically with regard to nation building in South Africa. Secondly the focus narrows to the use of the sports event as a means of generating an urban intervention which uplifts an area of 'lost space' within the Kings Park Precinct. The final point focuses on creating a relevant and meaningful architectural response, which is responsive to both its users and the surrounding context.

The design of the proposed urban and architectural intervention will be facilitated through the investigation of recent literature, theories, precedent and case studies, and personally conducted interviews with informed professionals. This research will determine a relevant architectural typology which is responsible and appropriate to its context. The design process becomes a reaction to defined internal and external stimuli with inherent restraints and opportunities, in which the end result becomes a synthesis of multiple inputs, generating a unique hybrid architecture.

ACKNOWLEDGEMENTS

I wish to thank my parents first and foremost, because without their love, faith and support over the past years, I would never have accomplished what I have. A special thank you to my girlfriend, Kylie, for her support over the last five years, it has really kept me going and I am so grateful to have you all in my life. Lastly and most importantly, to my Lord and Saviour, Jesus Christ, through you all things are possible.

I would like to acknowledge the following people whom have been directly involved in this research dissertation:

- To my document supervisor, Prof Ambrose Adebayo for his support and assistance.
- To Kevin Bingham, and Brandon Robertson for their motivation and ability to make me work harder and go further.
- To the librarians and staff at the Barrie Biermann Architecture Library, thank you so much for all your help.
- To my friends and colleagues who were always there to lend a helping hand.

Note: All the illustrations within this document are by the author unless acknowledged otherwise. All photos were taken by author during January 2009 and January 2010. The figures of the chapter headers are courtesy of Clint Strydom Phototgraphy.

INTRODUCTION

Architect Richard Rogers believes that, *"If we can fuse social and urban concerns, technological innovation, and environmentally responsive design, this will create an architecture which reflects the requirements of the 21st century"* (Gissen, 2002: 173). It is for this reason that the research progression of this thesis starts from a macro context and narrows to the micro. More specifically the research begins with social concerns which then narrows to urban issues and finally focuses on architectural matters.

Chapter 1- Research Background: The first chapter introduces the reader to the identified research problems. It develops a hypothesis and identifies key questions necessary to resolve the reaserch problems. It then sets out the aims and objectives which will determine the direction of the research.

Chapter 2 – Research Methodology: This chapter will define the research approach and methodology used in the dissertation. It describes the procedures for data collection and will also identify the techniques and methods used. The research methodology will take the form of primary and secondary research. Furthermore, the target group which forms part of the primary research will be outlined.

Chapter 3 – Literature Review: The literature review begins by looking at the social aspects of sport and its importance in society. It investigates the unique historical and current context of sport in South Africa; from this a relevant architectural typology and precinct for the proposal will be identified. The literature review then analyzes the historical and current context of the precinct, which investigates previous urban proposals for the area and the patterns of developments in the region. It identifies the positive and negative aspects of the precinct which informs relevant urban theories which respond to these unique conditions.

Chapter 4 – Theoretical Framework: This chapter is expounded in two sections, 'Urban Theories' and 'Architectural Theories'. The 'Urban Theories' respond to the positive and negative aspects of the precinct which have been identified in the literature review; this is done in order to resolve the identified problems and enhance the positive elements of the surroundings - creating a successful public realm.

Firstly the theories of Roger Trancik, Kevin Lynch and others will be investigated in order to reintegrate the 'Lost Space' of Kings Park Precinct with its surrounding context. Secondly, the theories of compact cities and mixed use developments will be examined in order to create a safe, well used environment

which is vibrant at all times. Thirdly, Jan Gehl's theories of life between buildings will be analysed to determine how to create a successful public realm. The fourth section will briefly examine the theories of catalytic developments, as a High Performance Centre (HPC) is seen as one of the three major catalytic projects for the precinct. This will establish the important role of these development types. Lastly the theories of 'cultural mobility' will be explored to encourage social interaction between the diverse local population. These theories will facilitate in the creation of a successful public domain within the sports orientated precinct of Kings Park, which will provide the necessary framework for the proposed HPC to be integrated.

The 'Architectural Theories' centre on identifying an appropriate architectural response of a regional HPC for Durban. In order express the ethos of the typology, the built environment was perceived as an abstract notion of the activities taking place inside. Functionally, a High performance centre is about using advanced technology to optimise performance, health and efficiency within the human body. Therefore similarly, parallels can be drawn in architecture, were the built form can be combined with advanced technology in pursuit of a healthy/ecologically sustainable built environment which functions in an optimal way. The architectural expression will therefore aim to create an environmentally sustainable intervention in which the buildings 'performance' between user and surrounding context becomes a generator for the architecture. This will be done in order to create, a more meaningful architecture which expresses the 'DNA' of the building while relating to the users and surrounding environment. The theories investigate how to create a healthy environment for the users in order for them to perform at there best. In addition to this ,the theories aim at integrating the architectural proposal into the natural surroundings of Kings Park, in order to preserve the natural beauty of the region. It can therefore be seen that the architectural theories focus on creating an appropriate and meaningful architecture which responds to both its surrounding environment and users needs.

Chapter 5 – Precedent Studies: This chapter will critically analyse examples of projects which demonstrate issues or design ideas, relevant to the proposed scheme. Many of the precedents demonstrate theories discussed in the previous chapter. They will be used to glean important and useful information which will affect the design of a brief for the proposed High Performance Centre for the Kings Park precinct.

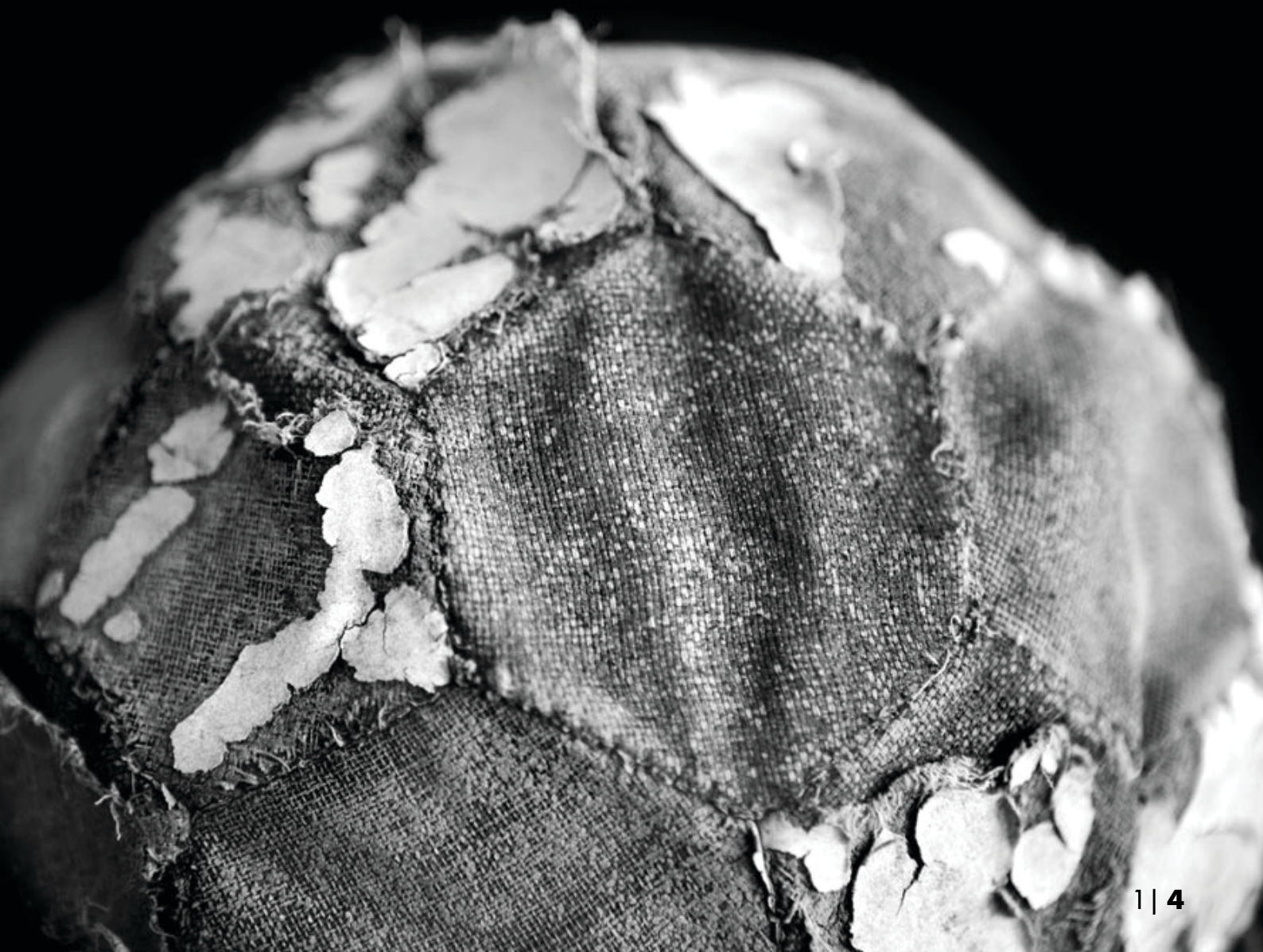
Chapter 6 – Case Studies: This chapter analyses local examples of architecture which cater to high performance sports. It moves away from the purely theoretical and begins focussing on the practical issues of architecture. The majority of this chapter is primary research, with the analysis of case studies undertaken first hand, with dimensioned drawings, photographs and a critical evaluation of the buildings. This will be done in order to provide more insight into the proposed HPC and its functions, as users of the facility can be interviewed about their thoughts on the facility and the building experienced for oneself. The analysis will identify both the positive and negative aspects of each case study; providing valuable lessons which can be applied to the design proposal. Ultimately this chapter becomes an important guide/reference to the proposal; helping to inform a schedule of accommodation and brief for a Durban based HPC.

Chapter 7 – Brief Derivation & Site Selection: The information gleaned from the literature review, theories, precedent studies and case studies will be used to derive a brief and facilitate the design of a HPC for Kings Park, Durban. The outcome of this chapter will establish guidelines which will result in the design of the proposed HPC. Brief derivation begins analysing the client's aims and objectives for the project. This will lead to the drafting of a schedule of accommodation and the description of the spaces therein. The Urban Design Goals and Objectives will then be stated, and an appropriate site will then be selected via a SWOT analysis. This chapter will provide the necessary guidelines/restrictions for the design of an urban framework and High Performance Centre for the Kings Park Precinct, Durban.

Chapter 8 – Conclusions & Recommendations: The final chapter draws conclusions to the findings and information gathered.

1 RESEARCH BACKGROUND

The research background will deal with the crucial questions necessary to investigate the dissertation topic. It will state the research problem, hypothesis and key questions to be asked. It will also set out the aims and objectives to determine which direction the research will take.



1.1 RESEARCH PROBLEMS

There are three primary research problems:

1. **Social:** Although sport in South Africa has played a major role in eliminating apartheid's unethical policies, it still faces the problem of 'nationalizing' its people, that is, unifying distinct cultural, ideological, religious and racial community groups. The phenomena of the 1995 Rugby World Cup proved that sport has the ability to promote unity between people. However due to the inequalities of apartheid politics and the subsequent international sports boycott, South Africa has not been able to develop all sports codes to their true potential. This was most evident in the recent 2008 Beijing Olympics where South Africa could only achieve one silver medal, the nation's worst showing, in the history of the games. Due to metonymic relationships shared between nations and their athletes, much disappointment was felt within the South African community.

2. **Urban:** Durban as an urban centre has for a long time recognised the positive roll that major sporting events play in the development of a cities; infrastructure, economy and international recognition. However the city has yet to develop its sporting precinct to the level of other international sport-scapes. Kings Park is a precinct of stark contrast; on the one hand, during sports events the area is vibrant and full of life; on the other hand, during regular week days, it becomes a desolate and under-used part of the city. Due to the poor planning of the past, the precinct has become a barrier between surrounding precincts and is not integrated into the surrounding urban fabric.

3. **Architectural:** Architect and author, David Leatherbarrow believes that the current tendency in architecture is to separate identity and function, which has divided the interaction between the building, the user, and the environment (Leatherbarrow, 2005: i). Therefore identifying an appropriate and meaningful architecture, which is responsive to both the users and surrounding context is of the utmost importance.

1.2 HYPOTHESIS

To determine an appropriate architectural/urban design intervention for Durban, in order to harness South Africa's sporting talent and uplift an area of 'lost space' through the creation of a meaningful architectural response.

1.3 KEY QUESTIONS

The key questions are the main concerns needed to address the research problems. The answers to these questions will ultimately help formulate an appropriate architectural/urban design solution.

Main Questions:

- What is the importance sport in society?
- What is the appropriate urban design response for the sports orientated precinct of Kings Park?
- What is the appropriate architectural typology needed to harness South Africa's sporting talent?
- How can the built environment facilitate in enhancing the users sporting abilities?

Subsidiary Questions:

- How have other cities used sports events to revitalise lost space and create successful public realms ?
- What forms of public space would allow various cultures and lifestyles to interact and share new experiences, encouraging unity between each other?
- How will the urban framework create a precinct which is integrated into the surrounding urban fabric, well used and vibrant at all times of the day?
- What is the chosen site's historical and current context?
- What are the precincts positive and negative aspects? This will guide the research to relevant theories in order harness the unique features of the region whilst resolving the negative aspects.
- Have there been any urban proposals for the precinct? If so what lessons can be learnt from these initiatives?
- Are there any existing facilities which cater to high performance sport in South Africa? If so, what are the main functional components within these facilities?

- What are the sizes and volumetric requirements for certain functions?
- What are the technical requirements needed for certain functions (finishes, technologies, equipment etc.)?
- What is the most fitting site for the proposed facility?
- What users will occupy the building and interact with it? The users will determine the architectural response and how the spaces will be used.
- Does this building allow access to the general public? If so what functions and services will the facility provide and how will the interface between athletes and the general public be programmed?
- How will the building cater to disabled users?
- What initiatives will ensure the building's economic sustainability?
- How will the ethos of the building typology be expressed?
- What techniques and technologies are appropriate in reducing the buildings negative ecological impact while portraying the facilities healthy ideals?
- How would the architectural intervention maintain and preserve the natural ecological balance of the Kings Park Precinct?

1.4 AIMS AND OBJECTIVES

There are three primary objectives to this dissertation which aim to answer the three research problems; this will facilitate in creating an appropriate architectural and urban design response for Kings Park, Durban.

1. **Social:** Architecture inevitably operates fundamentally outside its internal discourse, affected by social, economic and political forces. The phenomenon of sport will therefore be investigated, (particularly in South Africa and more specifically Durban), to determine its social impact. This will inform an appropriate architectural typology and urban precinct for the intervention.

2. **Urban:** The aim of the urban design initiative will be to use the opportunities of a major sports event to uplift an area of 'lost space'. The urban design will form a framework which is integrated with the rest of the cities structure. This framework will aim to enhance existing positive features of the precinct whilst resolving the negative aspects. It will focus on creating a successful urban space which is well used and vibrant at all times – both during events and regular week days. Another key element of the urban framework would be to create spaces which facilitate new interactions and experiences between people of different cultures and lifestyles. These spaces aim to create common ground which would allow for society to interact, encouraging an inter-relationship and unity between each other – 'nationalising the people'.

3. **Architectural:** Another aim is to determine a meaningful architecture which is responsive to both its users and surrounding context. In order to express the ethos of the typology, the built environment will be perceived as an abstract notion of the functions taking place inside; efficiency, health and technology. The users of a HPC require a healthy environment to perform at their best. It would therefore be appropriate to expose the occupants to a healthy environment within the building, thus reducing the risk of sick building syndrome and other problems, allowing them to enhance their sporting abilities. Another important objective would be to maintain and preserve the natural ecological balance in the Kings Park precinct, by creating an architecture which is responsive and integrated into the chosen sites conditions. It can therefore be seen that the built form aims to expresses the 'DNA' of the building while relating to the users and surrounding environment, in order to create a meaningful architecture.

2 RESEARCH METHODOLOGY

This chapter will define the research approach and methodology used in the dissertation. It describes the procedures for data collection and it will also identify the techniques and methods used. The research methodology will take the form of primary and secondary research. Furthermore, the target group which forms part of the primary research will be outlined.

2.1 SECONDARY RESEARCH

The secondary research will be expounded in two sections; a 'literature review' and 'precedent study'.

1. Literature Review

The literature review will examine relevant literature pertaining to the issues being investigated, and drawing relevant conclusions to inform the primary research. The indicators/issues generated from the literature will inform: topics to be a investigated, relevant people to interview and key questions to be asked. The indicators will direct the research to particular theories and precedent studies.

2. Precedent Study

International precedents will be examined to investigate particular issues surrounding the proposed topic. Precedents will include; precincts which have used sporting events to uplift areas of 'lost space', buildings with similar typologies and spatial relationships, appropriate ecological initiatives and technology, and architectural expression. Information gathered for the precedent studies will be taken from books, architectural journals and articles. The investigation of the chosen precedents will be documented, with findings and conclusions stated in the dissertation.

2.2 PRIMARY RESEARCH

The primary research, has been informed by the secondary research. It consists of original data obtained by the author and will take the form of interviews, case studies, solar study and measured drawings of existing structures on site. Primary research will consist of two major sections:

1. A series of structured or semi structured interviews with professionals in the fields of sports science, sports medicine, urban design, architecture and related disciplines will be conducted. The target group is a selected group of people chosen by the author to provide the primary information for the research. The target group includes:

- Mike Andrews (Strategic Proposals/Planning)
- Prof. Tim Noakes (Cape Town Sports Science Institute)
- Danie Du Toit (Academy Manager at HPC)
- Occupants of the chosen case studies

- Don Albert (Architect - Pretoria HPC: Soundspacedesign cc.)
- Deane Macquet (Physiotherapist)
- Prof. Ambrose Adebayo (Architect - Moses Mabhida Stadium and surrounding precinct)
- Derek White (City Engineers, Senior Planning Officer – 1999 proposal for the Kings Park precinct)
- Kevin Bingham (Architect - Involved in Durban Olympic Plan)

2. The analysis of case studies, are to be undertaken first hand on relevant local examples, with dimensioned drawings, photographs and a critical evaluation of the buildings. This will be done in order to determine dimensions, spatial relationships, processes and functions requirements of the buildings. The case studies will reveal how architects have dealt with issues of architectural expression, integration into the urban fabric and response to socio-economic and environmental circumstances.

Other aspect of the primary research will include; an analysis of any existing structures that happen to be on site, and a solar study conducted on the selected site of the proposal. This will inform the orientation, massing and shading devices of the built form. The primary research proved to be a valuable source of information which has given the dissertation a strong base.

2.3 CONCLUSION

The combined primary and secondary research will be used in the formulation of a brief by the researcher, to derive an appropriate architectural/urban design intervention, which addresses the research problems. The information gleaned by the researcher will help inform the spaces requirements, schedule of accommodation, philosophical stance, urban response and other architectural requirements of the proposed facility.

3 LITERATURE REVIEW

The literature review is an investigation into the chosen topic of sport. The main sources of the literature study will be dissertations and published articles in books and journals dealing with the importance of sport in society; with particular emphasis on South Africa's sporting past and current context, as well as the study areas historical development to the present pay. The research bridges a number of academic disciplines, from architecture and design to sociology and psychology, and will ultimately aim to inform an appropriate architectural typology and develop indicators as to relevant theories, precedents and case studies to investigate. These identified points will facilitate the appropriate architectural/urban design initiative.

3.1 THE RELEVANCE OF SPORT IN SOCIETY

Historian, Eric Hobsbawm once described sport as, "*one of the most significant practices of the late 19th century. Its significance was even more marked in the late 20th century and will continue to grow in importance as the world develops into a 'global village' sharing the English language, technology and sport*" (Bale, 2004: i).

What is the purpose of sports? To find an answer, one should broaden their way of thinking. Immediate thoughts are of fun and competition. However sport is part of every culture and can be used to bring people together, even entire nations. It is a unique vehicle in transgressing social differences, "*Such a vehicle is universal in its appeal, a common denominator, opening doors to all levels of society. It is international in scope without cultural or social hang-ups. It moves swiftly through all differences - race, religion, age, and sex*" (Fig 3.1) (Carey, 2004: 1). It crosses language barriers and slices through national boundaries by, attracting both spectators and participants to a common universal language of passions, obsessions and desires (Rowe, 2004: 2).

FIG 3.1: SPORT AS A COMMON DENOMINATOR IN SOCIETY - EXCITEMENT OF BAFANA BAFANA'S FIRST MATCH IN THE NEW MOSES MABHIDA STADIUM - 26TH JANUARY 2010.

There is no doubt that sport, in all its different manifestations and expressions, is one of the most universal and ubiquitous features of popular culture. Practiced by civilizations throughout history, sport is a pastime intrinsic to human nature. Contests in skill, strength and perseverance have always occupied an important place in every culture either in connection with ritual or simply for fun and festivity (Dunning, 1971: 11). From, ancient games focused on competition and controlling nature, to the complexity of sporting events in our modern society, events which have transformed into social, economic and cultural phenomena in themselves (Broto, 2005: 7 & Dunning, 1971: xviii).

Prof. Keim Lees of the University of the Western Cape; an expert in the role of sport in South Africa, is of the opinion that sport is increasing in importance due to a society driven by imagery and the media. Such is the role of sport in modern society, that the average individual will be more exposed to sport

and its related intrigues, than to political and economic issues. He notes that sport is an essential part of the rhythm of society whether it affects us directly or indirectly, as active participants or passive spectators, sport ingrains itself into our daily activities (Hansen, 2007: 9). Unlike other forms of entertainment, sport evokes passions that go beyond most other experiences. John Hargreaves, author of many sports related books, attributes the popularity of sport to three main characteristics: firstly, he noted that sport, in comparison with other types of social activity, consisted of play. Secondly, the uncertainty of the outcome of the sports contests, and the attendant tension it creates, lends a unique excitement to them. Thirdly, sports provide drama and 'regular public occasions' for discourse on some of the basic themes of social life (Horne, 2006: 4 & Rowe, 2004: 1).

It is a generally accepted fact that sport contributes positively to the development of an individual and the community. The United Nations classifies participation in sport and recreation as a fundamental human right, which all governments must provide for their people (Hansen, 2007: 9).

The Commonwealth Federation made the following observation with regard to the influence of sport on society: *"It is time that the integral role which sport plays in the process of nation-building is fully recognized. Sport is an investment. It is firstly an investment in the health, vitality and productivity of one's people. It is secondly an investment in their future. The social benefits include an overall improvement in the quality of life and physical, mental and moral well-being of a population. Furthermore, successful athletes serve as role models for the youth of the country, as achievers, as unofficial ambassadors, and as individuals committed to equality and fairness in competition"* (Fig 3.2) & (Fig 3.3) (Department of Sport and Recreation South Africa, 2002: 2) .

FIG 3.3: BAFANA BAFANA AS ROLE MODELS FOR THE YOUTH (KIRCHHOFF, 2008: 1).

FIG 3.2: YOUNG CHILDREN INFLUENCED BY THEIR HEROES (STRYDON, 2008: 3).

Athletes exist in a metonymic relationship with their respective nations, where individual bodies stand in for the collective community and are clothed and swathed in the countries colours and emblems which assist in the construction of national identity. This is why, when a team wins, it can often be heard that "we won" not," the team won". However, the inverse is also true; if a team or athlete is defeated, the whole country feels their hurt (Bale, 2004: 111).

Sport can play an enormous part in readdressing gender inequalities and discrimination against the disabled and minorities who have been excluded from mainstream society. This supports the notion that sport is a form of physiological therapy, used to rehabilitate individuals into society. Disability sport may provide the opportunity for acceptance and normalisation, maintaining society's equilibrium by providing positive opportunities and rehabilitative benefits. A wheelchair user, for example, may be disabled by the steps and kerbs of a shopping centre but may enjoy the benefits of not being disabled by, a game of wheelchair basketball in an accessible sport centre. This freedom will encourage self esteem and help individuals come to terms with their disabilities. Disability sport also has an impact on able-bodied persons, the Paralympic movement provides tremendous inspiration for people around the world to overcome adversity, and as a result disability sport has become more closely integrated with mainstream sport (Fig 3.4) & (Fig 3.5) (Houlihan, 2003: 119).

FIG 3.4: OSCAR PISTORIUS AKA BLADE RUNNER (RALSON, 2008, 17).

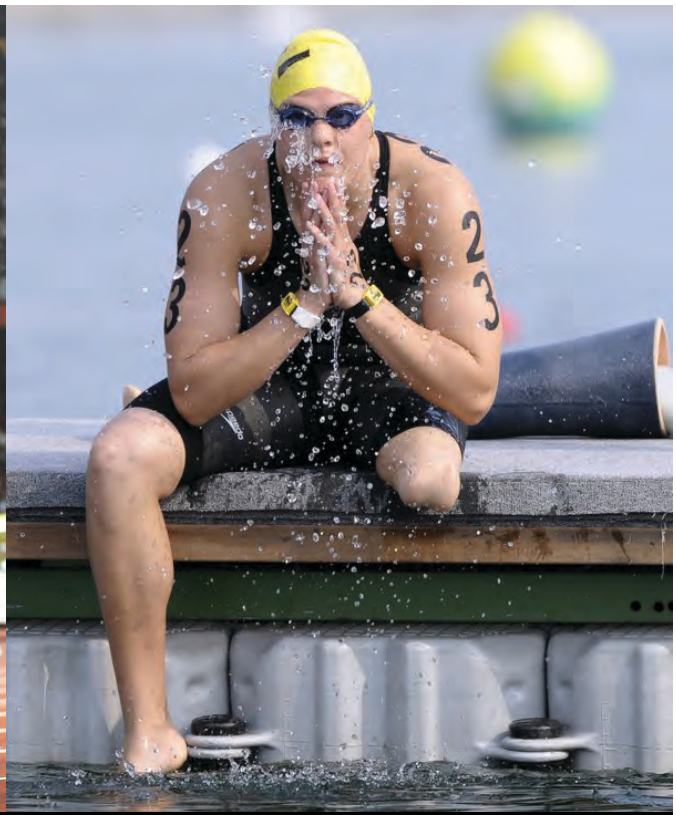


FIG 3.5: NATALIE DU TOIT (KAPPELER, 2008: 1).

The United Nations and International Olympic Committee (IOC), recognizes sport as an important part of the development in third world countries. "Sport takes people off the streets and into organized, safe and fun environments. It can build their confidence, providing them with drive and ambition (which improves scholarlistic performance *and other areas of life). It can direct them away from crime, drugs and anti-social behaviour. Most of all, sport provides meeting places and creates friendships between people of all backgrounds, which integrates and binds society and reduces hostility between community groups"* (Fig 3.6) (Barker, 2008).

Sport can empower disadvantaged individuals; as it is a sector which employs large amounts of talented young people, many from underprivileged backgrounds, and thus provides them with an opportunity to escape poverty by capitalising on their talents. As the sporting sector becomes more professional, more employment opportunities will be generated, particularly when hosting sporting events. Therefore the role that sport plays in the economy is crucial (Mlambo-Ngcuka, 2006: 2).

FIG 3.6: PHOTO SHOWING THE IMPACT OF SPORT REACHES ALL LEVELS OF SOCIETY, AND ITS IMPORTANCES EVEN IN RURAL AREAS (STRYDON, 2008: 3).

How many other aspects of society can so easily cut across political, social, and economic categorisation? While it would be naive to assume that sport represents entirely positive aspects of these categories, it nonetheless provides a platform of common ground, and for some countries is their only true social and communal ritual. This common ground facilitates in "cultural mobility" or opportunities for interaction between people of different cultures and lifestyles, allowing a change of perspective (Hansen, 2007: 13 & Robinson, 2002: 3).

However, the simple act of participating in sport is difficult without proper facilities; by providing a community with relevant infrastructure; it would allow for the 'generation of opportunities and events, allowing for increased participation and involvement in sport (Gratton and Henry, 2001: 190).

Sports modern character has gradually developed over time and will continue to change in the future. It is acknowledged that understanding the past, allows one to have a better understanding of the present and future. In this light, in order to fully understand the best way forward for sport in South Africa, the past and present patterns of development need to be critically analyzed. Now that sport has been identified as a component of daily life which has the ability to uplift, unify and create a strong sense of community identity. The following section will investigate the importance sport has played in the transformation of South African history.

3.2 THE IMPORTANCE OF SPORT IN SOUTH AFRICAN HISTORY

Today, sport promotes meritocratic structures: on the sports field the rules apply equally to all, irrespective of social influence, privilege, race or status. However in the 19th century, and for the first half of the 20th century, the notion of the sports field as a place of equals did not exist. Only those of the same economic classes, social status and race played together. Mixed sport remained taboo throughout much of the world until after decolonization and the horrors of Second World War, which transformed the politics of race. Most nations dismantled the official race policies in the 1950s and 1960s. Mixed sport was no longer taboo; sports ideologies now claimed that sport was a social unifier that transcended race and politics. African Americans began playing inter-racial sport in the United States in the early 1950s and 1960s; integrated sport emerged in Australia and elsewhere the following decade. South Africa, however, remained an exception; it was the last supporter of officially sanctioned racism (Booth, 1998: 5).

The apartheid (*meaning separateness or apart-ness in Afrikaans*) regime was an unfair system of legal racial segregation and white supremacy enforced by the National Party government in 1948. This system separated South Africa into four principal racial groups: African, Coloured, Asian or Indian and White. However these groups were often divided into whites and non-whites. The government segregated education, medical care, and other public services, and provided non-whites with services inferior to those provided to whites. Non-whites were subjected to widespread discrimination and hardships which affected all walks of life (Booth, 1998: xi).

FIG 3.7: SIGN IN DURBAN THAT STATES THE BEACH IS FOR WHITES ONLY UNDER SOUTH AFRICAN APARTHEID LAWS (GUINNOG, 1989: 1)

Under the apartheid Group Areas Act of 1950, many urban areas occupied initially by non-whites were re-designated as areas for whites only and, during the 1950s and 1960s, this led to the demolition of famous townships and locations with vibrant cultures such as Sophiatown in Johannesburg, District Six in Cape Town, Cato Manor in Durban and Top Location in Vereeniging. Forced removals, segregation policies and lack of facilities impacted heavily on social, sporting and cultural life, many teams were lost and competitions damaged (Fig 3.7).

Sport development within non-white communities was made difficult as local and national policies denied non-white's access to the best sporting facilities and the ability to take part in national or international competitions. Thus, identification with a national South African team, in any sport, was fraught with difficulties for many non-white sports people, because they were not allowed to represent the country in which they lived. As a result, many non-whites supported overseas sporting teams against the white South African ones. Other countries were also affected by the racial policies in place during the apartheid. If international teams had diverse races it meant they were unable to play in South Africa. Even white South African athletes who sought to play non-discriminatory sport had to leave the organization and go to non-racial competitions. Thereby giving up representation in sport and any hopes of playing for the national team. Due to this and apartheid's focus on maintaining and creating differential group identities, any form of true national identity through sport was made impossible (Nauright, 1997: 12, 74, 126).

Alcoholism, crime, illegitimacy and an absence of neighbourliness, dominated townships and hostel life. In this environment of hopelessness there was little room for sport. In 1981 a survey of important problems was conducted within these areas. It was discovered that one of the primary concerns was the lack of recreational facilities, non-white sports people received little encouragement to develop sporting talent or pursue sporting interest (Fig 3.8) & (Fig 3.9) (Booth, 1998: 64).

The distribution of sports facilities in Pietermaritzburg by a race, 1985
(Booth, 1998: 67)

White (53,000)		Africans (260,000)
17	**Bowling greens**	0
11	**Hockey fields**	0
8	**Rugby fields**	0
9	**Soccer fields**	8
18	**Squash courts**	0
3	**Swimming pools**	0
44	**Tennis courts**	6

FIG 3.8: SPORTS FIELDS, WYNBERG JUNIOR BOYS' SCHOOL 1991 (BOOTH, 1998 :144).

FIG 3.9: 'SOCCER FIELD' KHABAZELA, KWAZULU-NATAL 1991 (BOOTH, 1998 :145).

As apartheid became entrenched in the 1950s, sport began to be viewed as an area where pressure could be exerted on white South Africans (Nauright, 1997: 125). *As Dennis Brutus noted, 'White South Africans take their sport very seriously indeed, they are infatuated and obsessed by sport.... disasters elsewhere and international affairs are mere trifles compared to a sports victory- or even anticipation of a victory'* (Booth, 1998: xvii). The first victory against apartheid sport was won in 1956 when the International Table Tennis Federation removed the all-white South African Table Tennis Union and recognised the non-racial South African Table Tennis Board as the new controlling body. This decision was vital as it encouraged other sports organisations to take similar initiatives. The IOC banned South Africa from the 1964 Summer Olympics in Tokyo which was the start of the sports boycott and South Africa's isolation from international sport. During its 28 year course, the objectives of the sports boycott shifted. Initially non-white South Africans proposed the boycott as a strategy to integrate sport, but later recognised its potential to force political change. The sports boycott became a strong tool in the struggle against racial inequality in sport, as well as all aspects of life. The sports boycott was particularly successful as it was non-violent and was the only anti-apartheid strategy that adversely touched the lives of ordinary white South Africans (Booth, 1998: 3, 80).

At first, South Africa's Ruling National Party dismissed all demands to integrate sport or to extend political rights to non-whites, but extended international isolation forced it to make concessions, and by the mid 1980s the government had accepted integrated sport (Booth, 1998: 183).

February 1990 marked a critical point in South African history. In state president F. W. De Klerk's opening address to parliament, he committed the government to a negotiated resolution of apartheid. '*The aim*', he said, '*is a totally new and just constitutional dispensation in which every inhabitant will enjoy equal rights, treatment and opportunity'* in all spheres (Booth, 1998: 167). His promises of further reform encouraged the international community to lift the sports boycott. A consensus emerged that sports should be used to foster reconciliation, stability, cohesion and integration within the nation. Strong supporters of the boycotts began to speak a radically conciliatory language, whereby the 'new' South Africa could be founded on sport (Booth, 1998: xix).

After nearly three decades of isolation and exclusion, South Africa's return to international sporting competition was celebrated by being able to participate in the 1992 Barcelona Olympic Games, these were the first Games since Rome in 1960. The impact that this extended period of isolation was only too apparent, when measuring South Africa's performance to that of rival countries of similar size and strengths. Australia for instance claimed 27 medals compared to South Africa's two, none of which were gold (Booth, 1998: 194 & Steyn, 2003: 4).

After the 1994 elections, sport remained an integral element of post-apartheid politics and was viewed as one of the key areas in promoting reconciliation and racial integration in the 'new South Africa'. President Nelson Mandela and his government believed that sport was the best cultural activity through which to promote socio-political uplift; breaking down old barriers and fostering a new national identity and culture in which all South Africans are drawn together (Booth, 1998: 206 & Nauright, 1997: 193).

The 25th of June 1995 was a day of great celebration and patriotism for South Africa. It was the day of the Rugby World Cup (RWC) final between South Africa and New Zealand. Mandela strolled onto the ground wearing a Springbok jersey. It was an unprecedented act by any head of state and certainly by any South African leader. It drew the audience to their feet chanting '*Nel-son, Nel-son, Nel-son*'. 80 minutes and extra time later, South Africa was rugby world champion. Black and white South Africans embraced in celebration: Nelson Mandela and Captain Francois Pienaar embraced in a spontaneous gesture of racial reconciliation (Fig 3.10). It was a moment of intense nationalism, a moment when South Africans formed a 'natural' community whose interests transcended individual and social differences (Booth, 1998: 218).

FIG 3.10: NELSON MANDELA PRESENTS THE WILLIAM WEBB ELLIS TROPHY TO SPRINGBOK CAPTAIN FRANCOIS PIENAAR AFTER SOUTH AFRICA'S VICTORY IN THE 1995 RUGBY WORLD CUP FINAL (ELWORTHY, 2007: 1).

There is also a critical linguistic component to South African nationalism. The day after the 1995 RWC the Sowetan published the victory on its front page under the headline Amabokoboko ('the boks, the boks'). It was the turning point in the history of the Springbok, a moment more influential than even Mandela's support. Amabokoboko Africanised the Springbok and gave non-whites a stake in the emblem for the first time. It provided a critical linguistic mechanism to transform its meaning (Booth, 1998: 217).

The 1995 RWC was a defining moment in South African history as minister of sport, Steve Tshwete noted that *'Our young democracy witnessed the ability of sport to act as a catalyst to bring people together, share excitement and build a nation.'* (Nauright, 1997: 157). It showed the country fostering a spirit of nation building and enhancing reconciliation by building and nurturing the spirit of patriotism and pride (Mlambo-Ngcuka, 2006: 1). The shared passion for sport created a sense of belonging, pride and unity as people strove for a common goal (Evans, 2006: 1).

Although sport may have eliminated South Africa's inhuman apartheid policies and proved its ability to unify during the1995 RWC, it still faces the problem of what Ethienne Balibar calls 'nationalizing' its people, that is, drawing together distinct political, ideological, religious, cultural and racial interest. While South Africa is not alone in this task, the sheer diversity of racial and cultural groups, which share few common historical, linguistic, religious or symbolic ties, makes the Republics task seem impossible. Somehow, South Africa must entice and direct these diverse groups, into subordinating their local conflicts, customs and beliefs to a patriotic ideology (Booth, 1998: 207).

As Lincoln Allison notes, '*sport is one of the most potent of human activities in its capacity to give meaning to life, to create and interconnect senses of achievement and identity. Above all, and increasingly, sport has a complex and important interaction with nationality and the phenomenon of nationalism'.* This interaction occurs in at least three ways. Firstly, International sporting success is a key way that countries can promote themselves. These victories embody positive images of national qualities, strengths and ways of life, which are demonstrated to the rest of the world (Booth, 1998: 210 & Nauright, 1997: 2). Secondly, sporting events provide 'shared memories', which occasionally act as 'turning points in national history' and help forge ideas about 'common destiny'. Thirdly, people identify with the unique symbols, icons, anthems , songs and heroes of representative teams, which signify what separates and distinguishes nations from each other (Booth, 1998: 210). Sport has contributed more than any other sector in ensuring that the majority of people identify with their national symbols and colours and has developed a patriotic pride within the respective nations (Mlambo-Ngcuka, 2006: 1). Sport serves to give the individual in the 'lonely crowd' , of our impersonal modern mass society, a sense of belonging to a wider social grouping (Dunning, 1971: xix).

Under the ANC's Reconstruction and Development Programme (RDP), sport is listed as one of the key programmes for developing a new society. The RDP states that: "*Because of apartheid, sport and recreation have been denied to the majority of our people. Yet there can be no real socio-economic development without there being adequate facilities for sport and recreation in all communities. The RDP wants to ensure that all people have access to such facilities. Only in this way can all people have a chance to represent their villages, towns, cities, provinces or country in the arena of sport and to enjoy a rich diversity of recreational activities*" (Nauright, 1997: 161).

Although there has been a long trend of non-racism in the country, sport-scapes have not yet developed into non-racial, social environments which hold a unified 'imagining' of South Africa across

all people. Many sports remain largely divided on ethnic lines, due to the legacies of apartheid, the unevenness of capitalist development and massive discrepancies between rich and poor (Nauright, 1997: 180 &192). The national Department of Sport and Recreation (DSR) have developed a policy framework to try and overcome this problem. They have stated that the time has come to entrench a new democratic ethos in sport as part of the transformation process of uplifting the quality of life for all South Africans. The DSR has noted that sport remains unsurpassed as a means of transcending class and racial barriers, because it speaks a simple practical language of equality and togetherness. To support this, the DSR aim at providing the necessary infrastructure needed to take sport and recreation to all people – young and old, male and female, rural and urban, including disabled and handicapped. This is viewed to be achieved by providing facilities which would allow for a graduation system from casual participation to elite sport. Thereby contributing towards fully rounded, socially responsible, disciplined and healthy citizens (Department of Sport and Recreation South Africa, 2002: 13).

It is estimated that only about 10% of the South African population participates in competitive sport. This compares unfavourably with other countries, where normal ratios are in excess of 50%. To combat this, the DSR will ensure the development of programs and facilities which promote: talent identification, skills development and creating a nursery for high-performance sport (Department of Sport and Recreation South Africa, 2002: 9). "*If current successes result from providing for 20% of the population, would providing for 100% not lead to greater success?*" (Department of Sport and Recreation South Africa, 2002: 12)

Under the DSR's banner of 'Getting the nation to play' it is intended to positively redirect the massive latent talent available in the country whilst encouraging current elite performers to realise their potential. It was noted that a coordinated sport scientific support service for South African sports people is long overdue. If we wish to compete successfully in international sport, our athletes, trainers and coaches need such a service at their disposal (Nauright, 1997: 161).

The DSR has determined that there are currently too few central elite sports academies and provincial grassroots academies. The few existing facilities are exclusively elite-oriented, which lack focus in talent identification, making it difficult for a multitude of people to realise their potential in competitive sport. The DSR has stressed the importance of establishing an elite sports academy in each Province, with regional satellites for grassroots development and talent identification. These sports academies

are envisaged as "schools of excellence", where sporting potential at grass roots level is translated into realized talent. This talent is then nurtured and optimized by scientifically analysed methods and information systems to unlock excellent performance from our potential star athletes. (Department of Sport and Recreation South Africa, 2002: 9-11).

Sport has been closely interwoven within the fabric of South African history and has been at the forefront of social and political change. In the past South Africa has witnessed firsthand, sports ability to bring people together, even an entire nation, regardless of race, religion, age, and sex (Carey, 2004: 1 & Nauright, 1997: 2). Booth has stressed that sport still has a significant role to play in the future of South Africa, just as it has had in the past. He notes that sport has become one of South Africa's main cultural activities and remains the great public ritual of association due to its inherent characteristics - camaraderie, healthy competition, sportsmanship and above all, human interaction - which are all key factors in unifying and integrating society (Booth, 1998: xv).

Since South Africa's re-admission into international sport, it has achieved success in team sports; such as rugby, cricket and netball. This clearly indicates that there is no lack of talent in the country (Steyn, 2003: 4). Unfortunately however, due to the legacy of apartheid isolation and inherent lack of facilities, South Africa has been unable to harvest this talent in all sporting codes, thereby denying South African sport the ability to achieve its true potential. This has been particularly evident in the most recent Olympic Games of Beijing 2008 and Bafana Bafana's poor results.

3.3 THE CONTEXT OF CONTEMPORARY SPORT IN SOUTH AFRICA

The South African team was humbled at the 2008 Beijing Olympic Games (also known as 'South Africa's Games of shame'). Since the 2004 Athens Olympics, international athletes standards have progressed well beyond what might have been expected (*e.g. In 2008 the South African freestyle team that triumphed Athens actually swam faster than they had in 2004, but were still beaten by more than four seconds and by six other teams.*) The last time South Africa performed so badly in the Olympics was in 1936 when they won a single silver medal. South Africa's poor showing at the Games has caused much accusation and great disappointment for the country (Finch, 2008 & Tucker, 2008).

'*For many South Africans, sport is much more than mere escapism or an opportunity to demonstrate individual or team excellence. It is more than a religion; it is the Guardian of our national character; the barometer of our despair or hope*' (Nauright, 1997: 5).

Due to the poor performance at the Beijing Olympics, major sponsors have abandoned their support for Team South Africa, encouraging many of the countries' best athletes to move abroad to access better facilities, training and funding (Byrne, 2008).

During the past three decades several countries, most notably Australia, the USA and China have committed themselves to identifying and developing their sporting talent. The superior performances of the modern-day athlete are the product of a complex interaction of physiological, biomechanical, nutritional and psychological factors. Coaches today recognise that the most consistently effective methods of preparing his/her athlete for the demands of international competition are those based on proven scientific principles, rather than on trial and error. It has therefore become commonplace for the coach and athlete to seek input from qualified sports scientists in order for the athlete to reach his/her full athletic potential. A central component of the programmes employed in these countries, is the establishment of Sports Institutes or High Performance Centres (HPC's). These Centres aim to enhance the sporting performance through the provision of scientific and medical testing, monitoring and the direct application of the results of a high quality applied research programme. This is enabled though a close working relationship with the researchers. Since the development of the Australian Institute of Sport in 1981 the performances of Australian athletes has radically improved. In the 1976 Olympic Games in Montreal, Australia won a total of five medals; at the 1992 Barcelona Olympics they won 27 medals. China claimed a staggering 51 gold medals at Beijing 2008 compared to the 32 gold's

received at Athens 2004 games due to projects launched in 2001, which had similar aims to Australia. A strong case can therefore be put forward that those countries which are not competitive in the sports sciences, will ultimately become non-competitive in the international arena. (Prof. Timothy Noakes, SSISA, unpublished interview 12th December 2008).

KwaZulu-Natal is a major province in South Africa which does not yet have a sports institute. The only two local examples are the Sports Science Institute of South Africa in Cape Town and the High Performance Centre in Pretoria (Fig 3.11) & (Fig 3.12).

FIG 3.11: THE SPORT SCIENCE INSTITUTE OF SOUTH AFRICA, NEWLANDS, CAPE TOWN (COOKE, 1997: 11).

FIG 3.12: THE TUKS HIGH PERFORMANCE CENTRE, UNIVERSITY OF PRETORIA.

The need for a world class HPC in Durban was identified some years ago. "We want to give all the people of our region a chance of a better quality of life. We therefore have to create a built environment that enhances the rich diversity of our region – both cultural and physical." (Stewart, 1994: 1). There have been various proposals for such a facility in Durban, in most cases within the Kings Park precinct. This is consistent with the case studies in chapter 6 with each example being in or near an established sports precinct to make use of, and support existing infrastructure and facilities, thus creating a symbiotic relationship between functions and complementing the Kings park complex. The proposals envisaged the provision of community sport centres at key locations (e.g. Kwamashu and Umlazi); these would be supported by a larger, well equipped regional sport centre or HPC. It is argued that by locating this regional sports centre in the Kings Park Precinct it will be easily accessible to the majority of people in the region as it is located along major transport corridors and central to a high population of diverse people (Stewart, 1994: 1, 6).

Kings Park is ideal for sport due to the favourable regional climatic conditions and geographical features. Many elements need to combine to produce peak performances from athletes. Some factors can be controlled *(having the right training equipment, facilities and mental approach)*; others such as weather are beyond human control. Fortunately Durban's climate is ideal for an outdoor, sporting lifestyle. In recent years, international athletes have begun travelling to Durban to escape their harsh weather in favour of Durban's year round, warm subtropical climate. The need for a HPC is critical in attracting international athletes to Durban during their 'off' or winter season; as well as improving local athletes performance, preventing the athletic talent drain to Pretoria and Cape Town, as top KZN athletes are being poached with promises of improved chances of making national teams (Morgan, 2004: 1 & Osler, 2007: 1).

Dr Ross Tucker, who has a PhD in Exercise Science, has formulated a plan to get South Africa's Olympic aspirations back on track; he has dubbed his plan '2020 vision'. As Tucker explains, it is extremely important that the best talent finds the best coaches. However these optimal athlete-coach relationships happen so infrequently, that our best athletes rarely have access to the best advice. Tucker stresses that a centralisation of intellectual expertise is a key factor to success, along with the best scientific testing, administration and organization. A major part of Tucker's plan is a full time talent identification officer whose sole job is to find the athletes of the future (Finch, 2008: 113-114). Part of the success of this system relies on inspiration provided by country men and women, "*the system*

is inspired by the heroes it creates. People recognise that even their neighbours have done it. It creates self belief because a lot of up and coming stars can see that it has been done before" (Finch, 2008: 115). "This *is the best form of development money can buy as it creates a source of admiration and model for emulation"* (Byrne, 2008: 1).

Tucker explains that his system is not about medals but rather about uplifting people. He says, "We can see by the public outcry after Beijing that the country wants to prioritise sport without necessarily ignoring the big*ger issues."* (Finch, 2008: 115).

Conclusion: A world class HPC for Durban will have a positive impact on the neighbouring communities by providing grounds for interaction between a diversity of users. The facility will act as a vehicle in successfully binding various cultures and community groups; locally, nationally and globally. It will achieve this by using sport as common ground within society, creating an interface for social interaction between the diverse users of the HPC.

The role of the centre would enrich the regional and national sporting community by providing easy access to medical and scientific professionals within sport. The centre will incorporate all the necessary components needed to optimise and rehabilitate sports people, on both an amateur and professional level. It will also cater for the identification of sporting potential at grass roots level which will be translated into realized talent. This talent is then nurtured and optimized by scientifically analysed methods and information systems to unlock exceptional performance from potential star athletes. Creating an environment which synthesises developing talent and elite athletes would create a milieu for inspiration.

Other users of the facilities will include:

- The general public aiming to improve their sporting ability, health and self image.
- Both able bodied and disabled users.
- Professionals in the fields of sport science, sport medicine and coaching.
- Patients requiring rehabilitation and prevention of injuries of the muscular-skeletal system.
- Visiting local and international sports people and teams.
- The general public using the surrounding urban spaces.
- Students, Coaches and Lecturers of the tertiary education component.

The combined efforts of the HPC would further the advancement of South African sport, improving its sporting prowess. Research has proven the correlation between success of a national team and increased participation at grassroots level. It also shows that with success comes increased unity and patriotism between various community groups, encouraging a sense of togetherness, and building a stronger national identity (EdComs, 2007: 42).

The following section will investigate the surrounding context of the proposed HPC, in order glean information necessary to create an appropriate urban design/architectural intervention which enhances the positive features of the precinct, and integrates into the surrounding urban fabric.

3.4 HISTORICAL CONTEXT OF STUDY AREA

(Kings Park Sports precinct, Durban, KwaZulu-Natal, South Africa) (Fig 3.13).

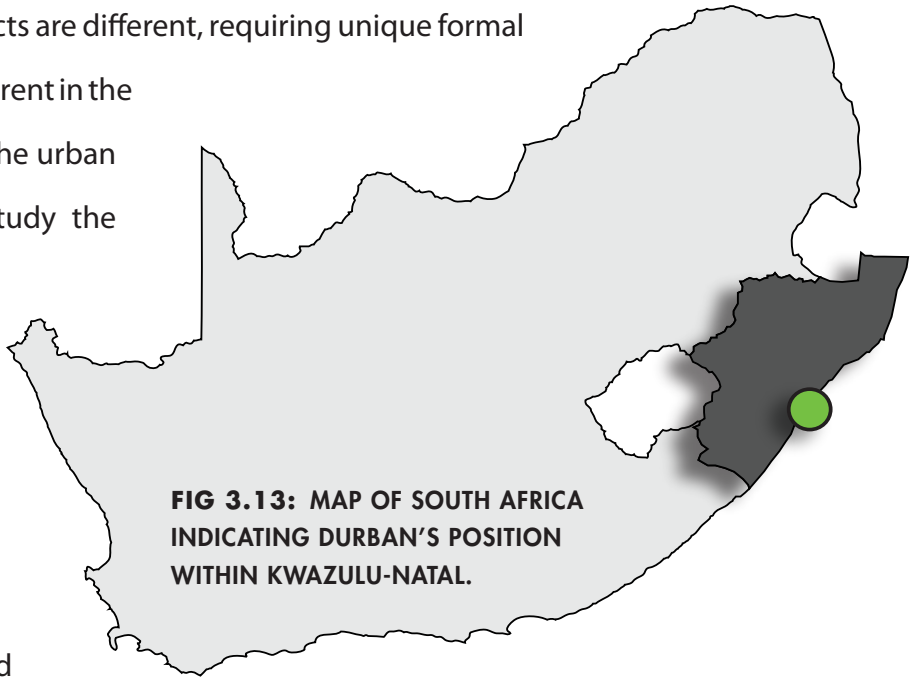


FIG 3.13: MAP OF SOUTH AFRICA INDICATING DURBAN'S POSITION WITHIN KWAZULU-NATAL.

As Trancik notes, all urban projects are different, requiring unique formal responses to the conditions inherent in the place in time. The first step in the urban spatial design process is to study the evolution of the structure of a place. Such studies should investigate major events that have influenced historic urban patterns, including important growth periods, planning proposals, and design competitions that have guided the development of urban form. The study of an areas unique history, surrounding built forms and spatial relationships, natural elements, human activities and needs are necessary in order to make informed design decisions. This approach preserves the richness of the context, retaining the identity of the place (Trancik, 1986: 229).

The Kings Park precinct is located between the Umgeni River to the north, the city centre to the south, Umgeni Road to the west and coastline to the east (from Blue Lagoon to the Blue Waters Hotel) (Ford, 1999: 39). The Kings Park district represents the largest district in Durban, and is one of Durban's predominant open landscapes accommodating all major sporting venues and provides the opportunity to capture major sports events (Fig 3.14) (COX Architects & Planners, 2004: 4).

FIG 3.14: THE STUDY AREA, KINGS PARK PRECINCT, WITHIN DURBAN.

History of Kings Park precinct: In 1835 it was decided that a plan should be developed to formally layout the town of Durban. It was composed of a grid iron street pattern with a central block left open for the market, town hall, courthouse and church. At this stage the northern reaches beyond the town (today's Kings Park precinct) were not integrated within the overall plan of Durban as it was considered inappropriate for settlement. This was due to its composition of flat, low-lying, swampland which flooded periodically, as it was part of the original course of the Umgeni River (Fig 3.15). The first developments for the precinct were therefore limited to the Eastern Telegraph Cable House (1910), the Kings Park agricultural shown grounds (1915) and the Durban Country Club (1919). However, between the late 1920s and early 1930s, a large municipal program of drainage and land reclamation was carried out. This in turn prompted developments of the Stamford Hill Aerodrome, the Durban Country Club golf course and market gardens at the present day Windsor Park golf course (Sparks, 1993: 19).

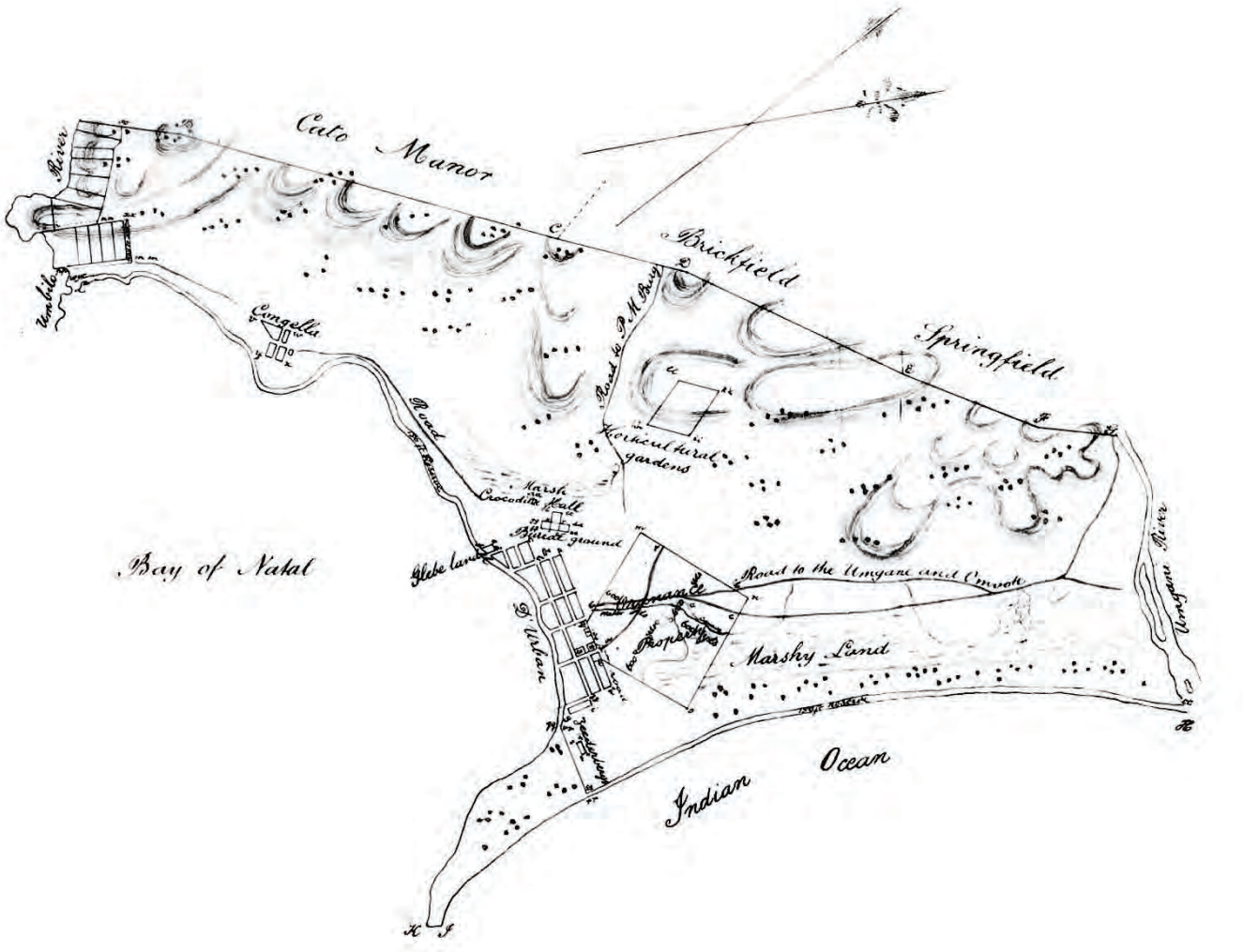


FIG 3.15: MAP OF DURBAN IN 1846 SHOWING LOW LYING SWAMP LAND WITHIN THE KINGS PARK PRECINCT (OKES, 1846)

Before the 1940s there was no planning framework for development in the area and as a result, facilities located themselves in an ad-hoc fashion, resulting in isolated land parcels without any cohesion with the surrounding urban fabric (Fig 3.16) (Sparks, 1993: 19). 1959 saw the first attempt at a planning intervention for the precinct as the Old Kingsmead grounds were unable to facilitate all sporting events, and due to the vast area of land which opened up due to the closure of the Stamford Hill Aerodrome. The land was considered most appropriate for sport, and was thus set aside as a sporting precinct for the city and province. This initiated the development of sports fields and the two stadia of Kings Park rugby (1960) and Kings Park soccer (1969). Following this, other facilities were provided between the 1970s and 1990s; these included the development of a cycling track, cricket, archery, equestrian, swimming, diving and athletic facilities which contributed to the areas designated function as a sports precinct (Fig 3.17) (Sparks, 1993: 19).

FIG 3.16: 1949 AERIAL PHOTO OF THE KINGS PARK PRECINCT INDICATING FACILITIES (DURBAN MUNCIPALITY,1949: G2 - H5)

FIG 3.17: AERIAL PHOTO INDICATING SPORTING FACILITIES WITHIN THE FACILITY OF THE KINGS PARK PRECINCT

One of the major problems of the site has been the encroachment of road and rail transportation systems; resulting in escalating noise and air pollution, as well as hindering accessibility to the site in an east-west direction (Fig 3.18). This limits access to the Umgeni area and beach front which has forced severe spatial imbalances, having unfavourable effects on future development. The introduction of a finer urban fabric with lower order roads would be a prerequisite to an integrated development. Another problem of the area is the limited amount of parking available, especially during an event. This should form an integral part of future proposals, whilst not littering the beautiful natural landscape of the area. Due to the Kings Park precincts poor geographical and planning past, the area grew as a sprawling low-density environment which remained an under-developed and underutilized tract of land, with no cohesion to the surrounding urban fabric (Sparks, 1993: 19, 49).

FIG 3.18: AERIAL PHOTO INDICATING NORTH-SOUTH BARRIERS OF THE FREEWAYS AND RAILWAY

In reaction to this, there have been many urban framework proposals for the Kings Park Precinct over the years. These consisted of the Holford and Kantorowich Plan (1965), the Mulder Plan (1984), the Durban Changes Forum Plan (1991), The Durban Olympic plan (1993) and the 1999 proposal by the City engineers (Ford, 1999: 40). Although the implementations of these plans have never been fully realized, important information and ideas can be gleaned by analysing the proposals. They will provide important insight into the formulation of an urban framework for this thesis.

The Holford and Kantorowich Plan (1965), and the Mulder Plan (1984): These proposals recommended that the Kings Park precinct be developed predominately as a lung for sport and recreation in order to position Durban as a unique sporting and recreation centre for Southern Africa. A more conclusive investigation will not be undertaken due to the numerous changes to the area since 1965, and that the following investigations have developed significantly from these previous plans (Ford, 1999: 41).

The Durban Changes Forum Plan (1991): The primary aim of this proposal was to create a fully integrated urban design framework with the rest of the city, to ensure an economically viable environment, creating benefits for all. This plan introduces a dense framework of apartment blocks for all income levels. This was done in order to provide for the demand of residential areas within the city and to support the existing city services within walking distance. A key way of integrating the proposal was to create a more permeable environment by maximising east – west links and connections to the city. A linear green park reintroduced the Umgeni River to the area in the form of lakes and canals running from the Umgeni River toward the city. The park was to create a central focus to the complex which provided sporting grounds for schools and recreational purposes. Contrary to the previous plans this proposal did not consider developing sport in the region (Fig 3.19) & (Fig 3.20) (Sanders, 1991: 3).

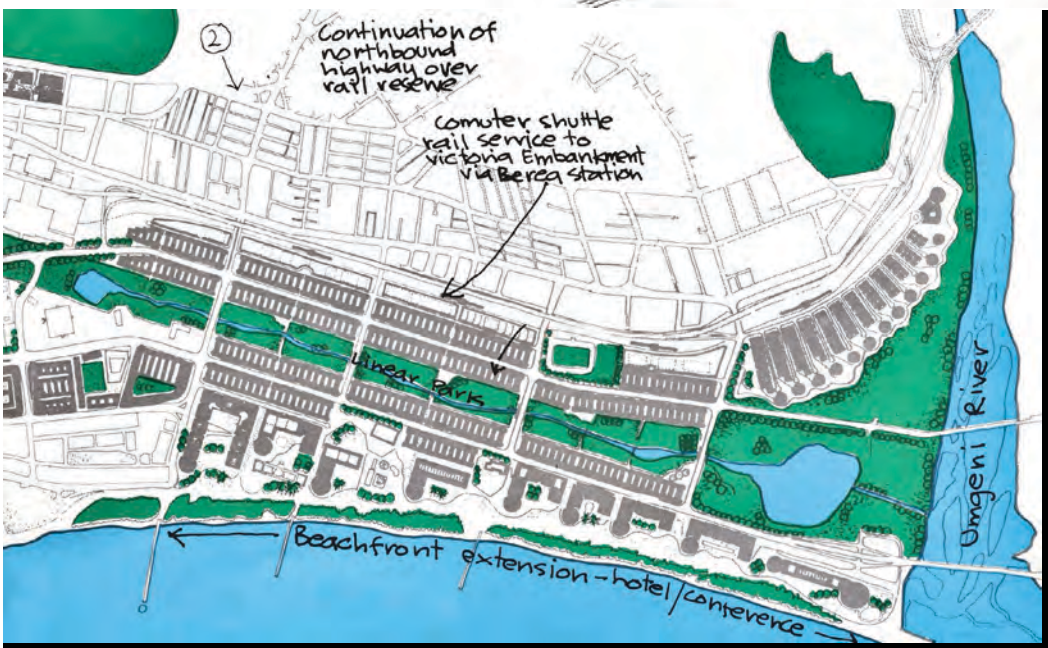


FIG 3.19: CONCEPTUAL SKETCH OF 1991 DURBAN CHANGES FORUM PLAN (SANDERS, 1991: 6).

FIG 3.20: 1991 DURBAN CHANGES FORUM PLAN (SANDERS, 1991: 5).

The Durban Olympic plan (1993): Since the mid 1980's, sport has begun to play a major role in the development of many countries from around the world. The sport sector has become a major contributor to economic development, social development, nation building within countries (Horne, 2006: 115).

It is becoming increasingly common to see sport being used as a mechanism for urban revitalization, creating a positive impact on the local economy. Countries are actively seeking to host major sports events due to: the status and the promotion of the nation, jobs creation, tourism, investment and the development of specific areas of land (many of which are underused or brownfield sites), and inward investment through tourism (Horne, 2006: 110 & Nauright, 1997: 161). The term 'urban revitalization' is a comprehensive and integrated vision and action which leads to the resolution of urban problems and which seeks to bring about a lasting improvement in the economic, physical, social and environmental condition of an area that has been subject to change (Horne, 2006: 17).

For many years Durban has sought to capitalise on these benefits by developing sport in the region. The Municipality has identified sport as one of the key strategies in the promotion of the City and Province. It has stated it will ensure that it develops and enhances many sporting codes in order to maintain Durban's identity of 'Africa's sporting capital'. By promoting sports events it was seen as an opportunity to generate a climate for change; generating income and developing better facilities for the people of the city and the wider population that would not otherwise be available (eThekwini Municipality, 2006: 67 & Nauright, 1997: 161).

In mid-1990 the possibility of South Africa hosting an Olympic games surfaced. Over the three years Durban, Cape Town and Johannesburg conducted preliminary investigations into hosting the event, and began to prepare bids for consideration by the National Olympic Committee. All the proposals emphasized the economic, social, psychological, and material benefits derived from the Games (Booth, 1998: 195).

The aim of the Durban Olympic plan was to, *"promotes Durban as an international sporting and tourist destination in order to improve the quality of life for all its people in the region; the development of sport to provide all people with equal opportunities for participation in, and advancement through sport; and the education of the young through sport in the Olympic spirit."* Even though Durban did not win the right to bid for the Olympics in 2004, the city set its sights on the 2020 Olympics and making Durban South

Africa's premier festival city. *"The Olympics was not an end in itself but part of a larger process which can still be achieved without the Olympics."* The infrastructure proposed would still be necessary for the population in the near future (Stewart, 1994: 3). *"Durban's bid for the Olympics [2004] revolved around the 'fixes' of the region [considering] the fantastic winter climate, the beauty, opportunities afforded by the natural features of the surrounding areas, and the well developed infrastructure of the city...What astounded the visiting groups assessing our bid, and many of those involved in this preparation, was the realisation of the immense potential offered by the land between the CBD and the Umgeni River, which forms a natural arena in the heart of our city. The Kings Park precinct gives the impression of having been planned from the outset as the site for a major festival, and appears to have been carefully protected and nurtured for this purpose. No other major city in the country, and few in the world, can boast that they have anywhere near the inherent potential of Durban to accommodate a full Olympic Park and all the facilities required within the heart of a thriving metropolitan environment, without having to displace any existing commercial or residential occupants."* (Stewart, 1994: 2).

The Kings park complex was therefore seen as the perfect area to host the games, capitalizing on the CBD's existing public transport networks, the unique character of the city and providing access to benefits for the majority of people in the region. The precincts central location makes it easily accessible and the adjacent hotels provide sufficient accommodation. The proposal highlighted the potential of Durban to provide the most compact Olympic in the history of the games. To this end the city promoted the 'Compact Games' which would minimise running costs, transportation needs and intensify the levels of festivities. The Kings Park precinct was seen to become a microcosm of the city, highlighting the uniqueness of the region (Stewart, 1994: 3). This plan therefore reintroduced the idea of the area being predominantly a sports and recreation lung of the city. It incorporated major Olympic stadia, sporting facilities, a media centre and an Olympic village which would provide 5000 varied housing units which would be converted to residential units after the games in order to cater for the people of the region. This, with the combination of mixed land use activity spines was intended to increase the efficiency and density of the inner city areas (Fig 3.21) (Stewart, 1994: 1).

The proposal aimed to provide a framework for the development of the city well beyond the requirements of the Olympic bid. The city saw this proposal as a vehicle for achieving a demographic and unified city, in which all people of the region could identify with. *"it was an opportunity to unify every one with a common goal, to push through reforms readdressing the imbalances of the past, to break*

down the apartheid structure of the city and to recreate Durban so that it will reflect a truly democratic spirit" (Stewart, 1994: 4). The principles were the reintegration of the fragmented region. This entailed improvements to transportation networks within the region by providing a new station in the heart of the precinct and the development of satellite facilities at core transportation terminals in outlying townships such as Kwamashu and Umlazi to allow all people to benefit from the facilities. Another way of integrating the region was to interconnect the 3 broad regions of the city, which consisted of the Point, CBD and Kings Park (Fig 3.22) (Stewart, 1994: 2). The creation of a plaza was intended to extend the popular post-event braai's and provide common ground between the previously separated black and white sports of soccer and rugby respectively (Stewart, 1994: 6).

FIG 3.21: MODEL SHOWING THE PROPOSAL FOR THE 2004 OLYMPICS (STUART, 1994: COVER).

This proposal envisaged that the area of Kings Park, "which is roughly the size of central park in New York, will develop into a huge open space park able to absorb the sports venues and infrastructural demands of the Olympics, all within a natural setting." Similar to the previous proposal of the Durban Changes Forum, this plan took advantage of the high water table and reintroduced the Umgeni River, as well as creating a landscaped pedestrianised precinct (Stewart, 1994: 6).

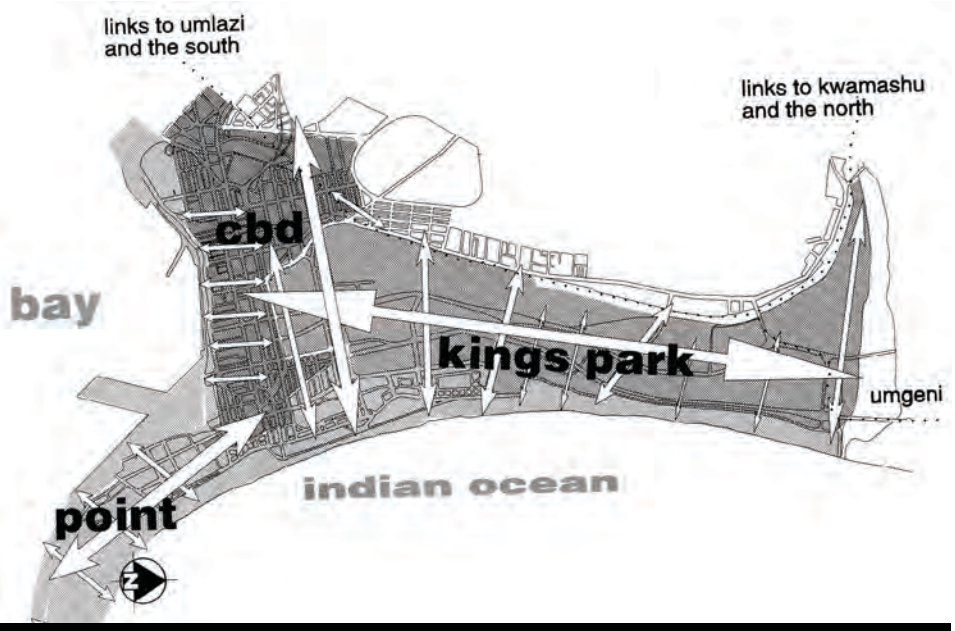


FIG 3.22: DIAGRAM SHOWING CONCEPT OF INTEGRATING CITY NODES (STUART, 1994: 3).

The 1999 proposal by the City engineers: This proposal was undertaken by the city engineers department headed by Senior Planning Officer, Mr Derek White. This proposal was a continuation of the Durban Olympics plan of 1993, seeing the Kings park precinct as a sport and entertainment lung for the city. However this proposal raised the issue of environmental awareness and prioritised in creating a sustainable development. The plan sought to maintain and highlight natural beauty of the area by reintegrate the Umgeni River into the area via a system of streams and wetlands while maintaining vegetation to create a sport and entertainment node in natural surroundings. The proposal also sought to reintegrate the precinct with the surrounding city fabric whilst creating a series of open spaces large enough to accommodate the crowds of major sporting events (Fig 3.23) & (Fig 3.24) (Ford, 1999: 44).

Since then the city has recognised the disconnected nature of the precinct and has therefore, set a goal to develop planning and design proposals that will unify the existing diverse sites elements and unrelated spaces, into a continuous, recognizable open space within the precinct. By doing this, it is the council's aim to creating a safer, functional, and aesthetically pleasing park environment, defining the park's image, while conserving, protecting and enhancing the existing environmental resources within the precinct (Sparks, 1993: 67).

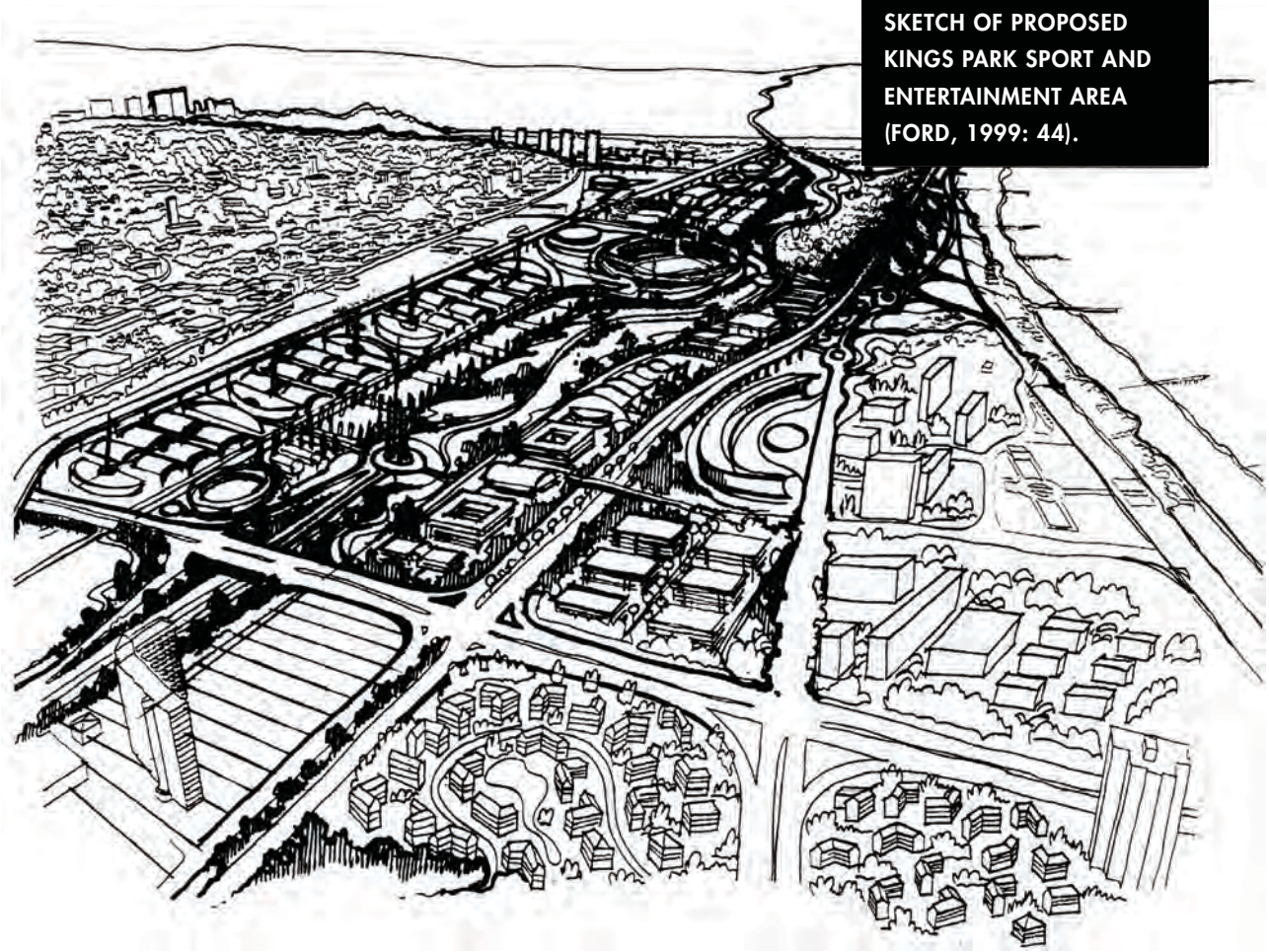
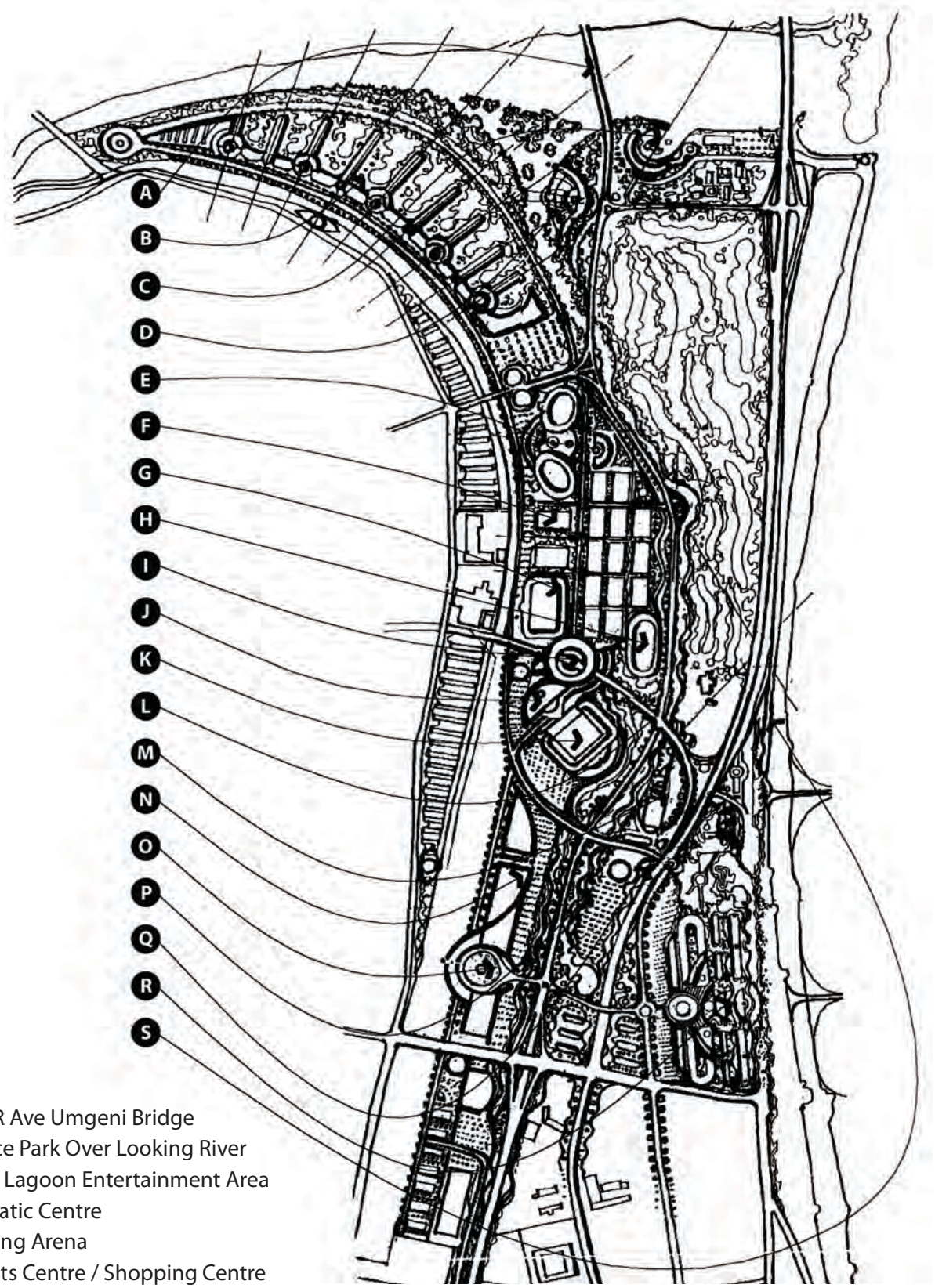


FIG 3.23: PERSPECTIVE SKETCH OF PROPOSED KINGS PARK SPORT AND ENTERTAINMENT AREA (FORD, 1999: 44).



A - NMR Ave Umgeni Bridge
B - Office Park Over Looking River
C - Blue Lagoon Entertainment Area
D - Aquatic Centre
E - Cycling Arena
F - Sports Centre / Shopping Centre
G - Kings Park Rugby Stadium
H - Kings Park Athletics Track
I - Public Open Space Linking Stadia
J - Sports Academy
K - Kings Park Soccer Stadium
L - Walter Gilbert Avenue
M - Kings Park Swimming Pool Complex
N - Exhibition Centres
O - New Rail Station
P - Overflow Parking Within Green Belt
Q - Green Belt River and Wetland
R - Proposed New Casino
S - New Ocean Sports Centre

FIG 3.24: PROPOSED PLAN INDICATING VARIOUS FACILITIES AND NODES (FORD, 1999: 45).

3.5 CURRENT CONTEXT OF STUDY AREA

The Kings Park precinct is one of the best open space areas adjacent to any city in the world. The area has traditionally been used as an open space for sport and recreation and this use has continued. However, recently the area has been under siege by groups interested in developing film studios, court complexes and used car yards. These building typologies add little or no human value to surrounding areas and would change the precinct into ambiguous, lifeless part of the city. It is essential that Kings Park and the immediate beach environment be kept as open space for recreation and conservation use as there will be a demand in the future for other sporting venues.

In Durban's recent 'Beyond 2010 Strategy' it is made known that, "eThekweni has the potential to host all 28 recognised Summer Olympic sporting codes within the precinct... *and within easy access of the city centre, central beaches and accommodation... [Furthermore] development of the Kings Park Sport and Recreation Precinct into a world class sports and recreation destination that caters for a range of local, provincial, national and international events is critical for achieving the vision of being Africa's premier sporting and leisure destination. This will be the only place in Africa where all the Olympic codes are situated in close proximity to each other and in world class facilities.*" (eThekwini Municipality, 2006: 2).

The benefits of major sports events would combat Durban's urban decline, where the city has been abandoned as a commercial centre resulting in new decentralised office parks in Westville, La Lucia and Umhlanga Rocks. This reduces human contact and the dissemination of information and cultural exchange. The reduced number of people decreases vibrancy and surveillance which results in higher crime levels. The development of new and environmentally frugal development by virtue of sporting events would attract businesses and lifestyle opportunities back into the city (COX Architects & Planners, 2004: 1, 4). The imminent 2010 FIFA world cup will benefit a broad spectrum of South Africans. Investment in the built environment is also seen as a unique opportunity to foster citizenship, and to 'stage' South Africa to the rest of the world. The FIFA World Cup has become an event that rivals the Olympics in its capacity to transform the economy, self-image and global identity of countries and cities that host it. According to research by the Department of Environmental Affairs and Tourism, the 2010 FIFA World Cup has been estimated to add an additional R21.3-billion into South Africa's gross domestic product (GDP). Of this estimated total, R12.7-billion is attributed to investment and job creation, while the remaining R9.5-billion will be attributed to tourism. Dr Azar

Jammine, Econometrix chief economist explains," *The 2010 World Cup couldn't come at a better time for South Africa. Given the economic crisis, South Africa would have been in a very different position without these events.*" (Hartigh, 2009: 1).

Durban in particular has been developing a substantial infrastructural legacy which would have been impossible without the 2010 FIFA world cup event. Several of these infrastructural investments include.

- The new Moses Mabhida multi-use stadium in the heart of Kings Park precinct, which will accommodate sports such as soccer, athletics and possibly rugby. The acoustics have been carefully designed to host music concerts, cultural events, parades and more. This will be a landmark structure for the city; its 106m high arch and cable car attracting many tourists, and instilling pride within the people of the region. This was identified by the city as the first of three catalytic interventions for the precinct (Fig 3.25).
- The other two future catalytic projects include a High Performance Centre and an indoor stadium of international standards.

FIG 3.25: THE NEW MOSES MABHIDA MULTI-USE STADIUM (ROGERS, 2010: 1).

- The equestrian stables are being relocated to a natural setting in Shongweni and tennis will be relocated from Westridge into the Kings Park Precinct.

- The areas around the stadium are also being upgraded (Fig 3.26) with the introduction of 'Peoples Park' to the south of the stadium, which will incorporate sports fields, children's play areas, a restaurant facility, ablutions and change rooms. 'Heroes walk' will be a promenade link between the city and stadium and celebrating South African sports heroes. The old Walter Gilbert Road will be realigned to accommodate 'Imbizo Place' on the northern side of the stadium, which is a large public park with retail, restaurants and cafes. The creation of a safe pedestrian link between 'Imbizo Place' and the beachfront, which is also being upgraded, between Blue Lagoon and Ushaka, due to 2010 events. During the FIFA events the beachfront upgrades will create fan parks which will provide giant screens, entertainment, food and beverages for people unable to make it into the stadium.

- There will be improvements to landscaping, increased widths of walkways, new street furniture and increased street lighting.

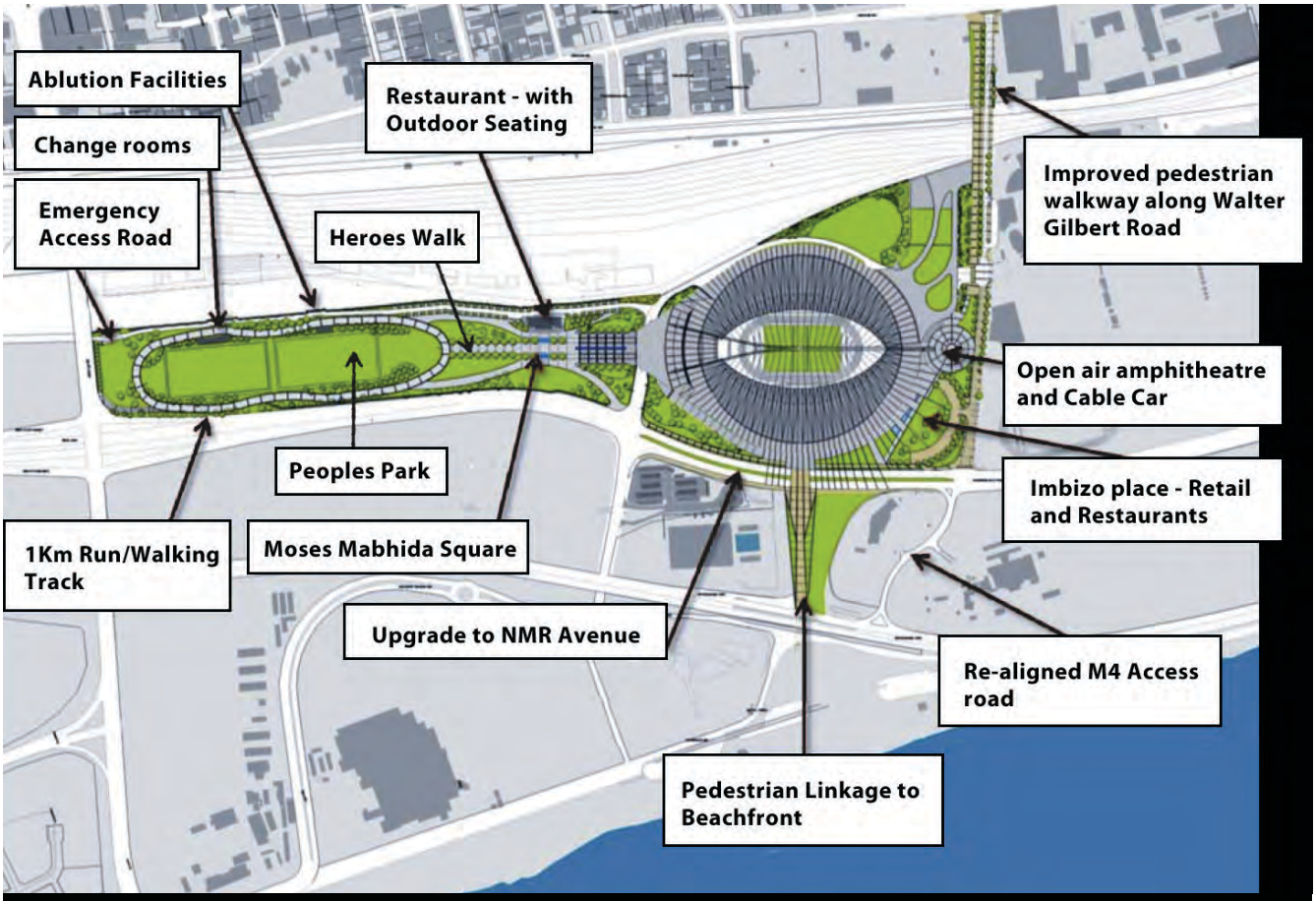


FIG 3.26: DEVELOPMENT PLAN FOR MOSES MABHIDA PRECINCT (ETHEKWINI MUNICIPALITY, 2009: 9).

- To host a major event such as the world cup the precinct must be accessible and serviced by an adequate public transportation system including rail, bus and taxi, with an adequate inner the city commuter system in place. Development and upgrade of the transportation network and nodes include; the provision of public transport lanes, the inner city distribution system of busses, improvements to the Warwick Junction interchange and infrastructure as well as park and ride access to the stadium. Two other major public transport improvements include the development of the new King Shaka International Airport in La Mercy and proposed Kings Park Rail Station adjacent to the stadium (Fig 3.27). Walter Gilbert will be pedestrianised during events and a pathway established to link the Kings Park Precinct with the beachfront.

The above infrastructure has been formulated with 'green goals' in mind. The city is encouraging these projects to adopt strategies which enhance the natural surroundings of Kings Park and leave a positive legacy (Prof. Ambrose Adebayo, UKZN-Howard Collage campus, unpublished interview 23th April 2009 & eThekwini Municipality, 2009: 1-5).

FIG 3.27: THE NEW KING SHAKA INTERNATIONAL AIRPORT (ASCA, 2008:1).

Looking beyond the 2010 FIFA Soccer World Cup, Durban seeks to position itself as Africa's premier sporting city, aiming to host the Commonwealth and ultimately the 2020 Olympic Games (Osler, 2007: 1). Durban has recently been chosen as the venue for the International Olympic Committee's general assembly congress in 2011 ahead of Hong Kong. *"Getting Olympic decision-makers from around the world in Durban is most important. We want them to see the infrastructure we have and are building. We believe the city has a strong chance of hosting the 2020 Olympic Games."* The infrastructural and professional provisions within the HPC would aim to enhance the possibilities of successfully hosting major sports events, such as Durban's 2020 Olympic Ambitions (Khumalo, 2008).

Robbie Stewart (1994) the CEO of the Durban Olympic Committee argued that "The *civic leaders of the past who kept the Kings Park area open for recreation presented this city with one of its most important assets.*" In order to harness the full potential of this asset the positive and negative aspects of the area need to be investigated to determine the best way forward for the Kings Park Precinct. The urban design intervention is one of the key components of this thesis, which is why it is necessary to evaluate the positive and negative aspects of the precinct. The information gleaned from the analysis will determine which urban theories and initiatives would be most appropriate and best suited to this urban realm.

Positive aspects of the precinct:

- The Kings Park complex is surrounded by a mixture of various cultures and community groups (ideal for encouraging interaction and binding society).
- Good access due to its central location and the new King Park station will improve public transport to the area, which connects to outlaying townships such as Umlazi and Kwamashu.
- Nearly all the land is state owned, therefore implementation of proposals would not involve the acquisition of privately held land (Sanders, 1991: 3).
- There are many existing facilities which would allow new facilities to be integrated and share a symbiotic relationship between each other.
- The large tracts of undeveloped land allow for easy construction with little demolition or removals of existing residents / inhabitants. (Displacement of communities occurred during the development of Barcelona's 1992 Olympic Games and in Beijing's 2008 Games) (Houlihan, 2003: 243).
- The natural beauty of the surrounding environment.
- Vibrancy during sports festivities, with the central green area proving immensely popular for post event braai's and events (Fig 3.28). It would therefore be important to maintain and enhance many of these existing positive aspects.

FIG 3.28: THE GREEN OPEN SPACES ADJACENT TO THE STADIUMS ARE A MAJOR ASSET TO THE PRECINCT AS THEY ARE IMMENSELY POPULAR FOR POST EVENT CELEBRATIONS AND BRAAIS.

Negative aspects of the precinct:

- Like many sports precincts the Kings Park complex has been unsuccessful as it has not considered life after sports events. As a result the precinct is only well used during sports events, and the area becomes desolate during regular week days, with the only form of vibrancy coming from athletes training. When events are not taking place at night, the area becomes uninviting or even frightening to walk through. It is important that the precinct benefits the people of the region on a daily basis maintaining vibrancy at all times.

- The precinct is a sparsely developed and underutilized tract of land, even though it is highly prized and valuable due to its proximity to the city centre and coast line. It would therefore be important to create a compact development to maximise land use and preserve the natural beauty of the region.

- The area is an isolated island which is not integrated into the rest of the Durban's urban fabric / structure. This is due to the poor planning in the past which has created impermeable barriers in the form of railways and freeways. This makes it difficult to access and enjoy all the cities assets. E.g. accessing the beach for running, walking and cycling. It would therefore be important to enhance linkages and permeability.

Now that the positive and negative aspects of the precinct have been identified, relevant theories will be examined in the following chapter to resolve the problems and enhance the positive elements of the surroundings. The development of this precinct would provide a unique opportunity for the development of a centrally located urban lung for Durban.

3.6 CHAPTER 3 SUMMARY

The literature review began by looking at the social aspects of sport and its importance in society. It was found that sport has a major impact on society as it is part of every culture and can be used to bring people together, even entire nations. It is a unique vehicle in transgressing social differences, "*Such a vehicle is universal in its appeal, a common denominator, opening doors to all levels of society. It is international in scope without cultural or social hang-ups. It moves swiftly through all differences - race, religion, age, and sex*" (Carey, 2004: 1). The Commonwealth Government noted that,"*It is time that the integral role which sport plays in the process of nation-building is fully recognized. Sport is an investment. It is firstly an investment in the health, vitality and productivity of one's people. It is secondly an investment in their future. The social benefits include an overall improvement in the quality of life and physical, mental and moral well-being of a population. Furthermore, successful athletes serve as role models for the youth of the country, as achievers, as unofficial ambassadors, and as individuals committed to equality and fairness in competition*" (Department of Sport and Recreation South Africa, 2002: 2).

Once sport had been identified as a component of daily life which has the ability to uplift, unify and create a strong sense of community identity. It was time to investigated the unique historical and current context of sport in South Africa; from this a relevant architectural typology and precinct for the proposal was identified. It was discovered that sport in South Africa has played a major role in eliminating the apartheid's unethical policies. However it still faces the problem of 'nationalizing' its people, that is, unifying distinct cultural, ideological, religious and racial community groups. The phenomena of the 1995 Rugby World Cup proved that sport has the ability to promote unity between people. It was noted that sport still had a significant role to play as an agent and catalyst for significant social change in South Africa. However due to the inequalities of apartheid politics and the subsequent international sports boycott, South Africa has not been able to develop all sporting codes to their true potential. This was most evident in the recent 2008 Beijing Olympics where South Africa could only achieve one silver medal, the nation's worst showing, in the history of the games. Due to metonymic relationships shared between nations and their athletes, much disappointment was felt within the South African community.

The superior performances of the modern-day athlete are the product of a complex interaction of physiological, biomechanical, nutritional and psychological factors. Coaches today recognise that the most consistently effective methods of preparing his/her athlete for the demands of interna-

tional competition are those based on proven scientific principles, rather than on trial and error. It has therefore become commonplace for countries to establish Sports Institutes or High Performance Centres (HPC's) for the coach and athlete to seek input from qualified sports scientists in order for the athlete to reach his/her full athletic potential. A strong case was therefore put forward that, those countries which are not competitive in the sports sciences, will ultimately become non-competitive in the international arena (Prof. Timothy Noakes, SSISA, unpublished interview 12th December 2008).

It was seen that the only two local examples of these centres are; the Sports Science Institute of South Africa in Cape Town and the High Performance Centre in Pretoria. KwaZulu-Natal is a major province yet to develop a sports institute or HPC. From this research it was deduced that a HPC for KwaZulu-Natal was the most appropriate architectural typology to successfully harness South Africa's sporting talent, improving its sporting prowess. Research has shown the correlation between success of a national team and increased participation at grassroots level. It also shows that with success comes increased unity and patriotism between various community groups, encouraging a sense of togetherness, and building a stronger national identity (EdComs, 2007: 42). Taking into account all the aspects of a HPC it was seen that the facility would best be sited in the Kings Park Precinct, Durban.

The literature review found that Durban has for a long time recognised the positive roll that major sports events play in the development and revitalization of cities. However it has yet to developed its sporting precinct to the level of other international sport-scapes. Architect and author Roger Trancik noted that, all urban projects are different, requiring unique formal responses to the conditions inherent in the place in time. It was for this reason that the research then investigated the historical and current context of the Kings Park Precinct. This provided the necessary information to create an appropriate urban design intervention which enhances the positive features and resolves the negative aspects of the precinct. This developed indicators as to the relevant urban theories which respond to these unique aspects of the precinct. These theories will be discussed in the next chapter.

4 THEORETICAL FRAMEWORK

This chapter outlines the theoretical framework which forms the basis for the design of the High Performance Centre for Durban's Kings Park precinct. The theoretical framework will be discussed under two sections:

Urban Design Theory: Successful Public Places

Design Theory: Creating a Meaningful Architecture

The theoretical discourse examines a range of architectural and urban design issues through the recognition of the ideas and theories of others, thereby contributing to the author's position and understanding of the underlying principles of the design approach. Ultimately, the theories and ideas explored in this chapter aim to develop guidelines, which will be drawn upon in order to support the realisation of a philosophical framework. This will facilitate the derivation of a conceptual framework and which will become a design generator for the proposed HPC and surrounding precinct. The theoretical design is concerned with the creation of successful public spaces and the informative expression of the Kings Park precincts context through the generation of an appropriate, meaningful and experiential architecture.

4.1 URBAN DESIGN THEORY: SUCCESSFUL PUBLIC PLACES

Urban Designer Malcolm Moor defines Urban Design as:

"The art of making places for people. . . . It concerns the connections between people and places, movement and urban form, nature and the built fabric, and the processes for ensuring successful villages*, towns and cities. Urban design is a key to creating sustainable developments and the conditions for a flourishing economic life, for the prudent use of natural resources and for social progress. Good design can help create lively places with distinctive character; streets and public spaces that are safe, accessible, pleasant to use and human in scale*" (Moor, 2006: 30).

As seen in the analysis of previous chapter (page 47), the positive and negative aspects of the precinct have been identified. This chapter discusses relevant theories in order to resolve the identified problems and enhance the positive elements of the surroundings. Firstly the theories of Roger Trancik and Kevin Lynch will be investigated in order to reintegrate the 'Lost Space' of Kings Park Precinct with its surrounding context. Secondly, the theories of compact cities and mixed use developments will be examined in order to create a safe, well used environment which is vibrant at all times. Thirdly, Jan Gehl's theories of life between buildings will be analysed to determine how to create a successful public realm. The fourth section will briefly examine the theories of catalytic developments, as the HPC is seen as one of the three major catalytic projects for the precinct. This will establish the important role of these development types. Lastly the theories of 'cultural mobility' will be explored to encourage interaction between the diverse local population. These theories will facilitate in the creation of a successful public domain within the sports orientated precinct of Kings Park, which will provide the necessary framework for the proposed HPC to be integrated.

4.1.1 'Lost Space'

According to Roger Trancik, 'Lost Space' can be defined as a space that has been left over or forgotten amongst the fabric of the city, a place in need of rejuvenation, in order for it to fully contribute to the surrounding city. These *'Lost Spaces'* create voids within the city fabric, where buildings are treated as isolated objects sited in the landscape, not part of the broader fabric of the city. These gaps disrupt the continuity of the city form, making linked pedestrian movement difficult and disorientating. These are poorly defined spaces which fail to connect elements in a coherent way (Trancik, 1986: 8).

According to the analysis in the previous chapter, the Kings Park Precinct fits this description of 'Lost Space' as the area has become an isolated island which is not integrated into the rest of Durban's urban fabric / structure.

In order to resolve this problem, Trancik has adopted three urban design theories to reintegrate 'Lost Space' into the surrounding city fabric, namely the Figure Ground Theory, Linkage Theory and Place Theory.

Figure Ground Theory: is the study of relative land coverage of buildings as 'solid mass' (figure) to the open void (ground) (Fig 4.1). It is essentially a graphic tool showing the relationship between the solid and void. This process is the starting point of understanding the city form and becomes a powerful tool to identify the textures and patterns of the urban fabric, as well as problems in the cities special order (Trancik, 1986: 98). Trancik notes that, "when the dialogue between the urban solids and voids is complete and perceivable, the spatial network tends to operate successfully" (Fig 4.2). By identifying the *'gaps' in* the spatial continuity of the city, fragmented elements or 'Lost Space' can be incorporated into the overall structure of the city's urban fabric, so that building and space can effectively coexist (Trancik, 1986: 106).

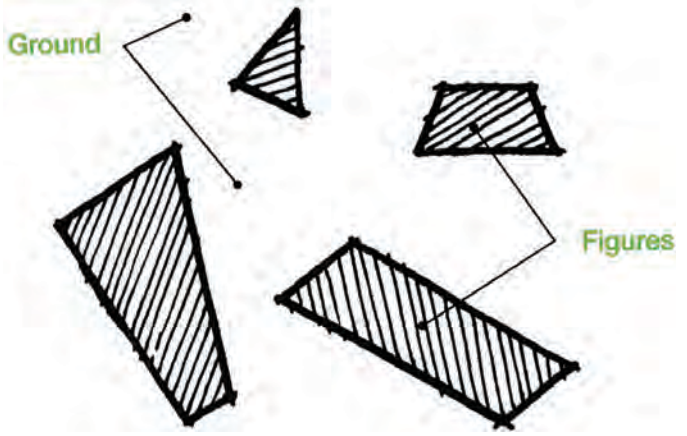


FIG 4.1: FIGURE GROUND DIAGRAM (FREDERICK, 2007: 2).

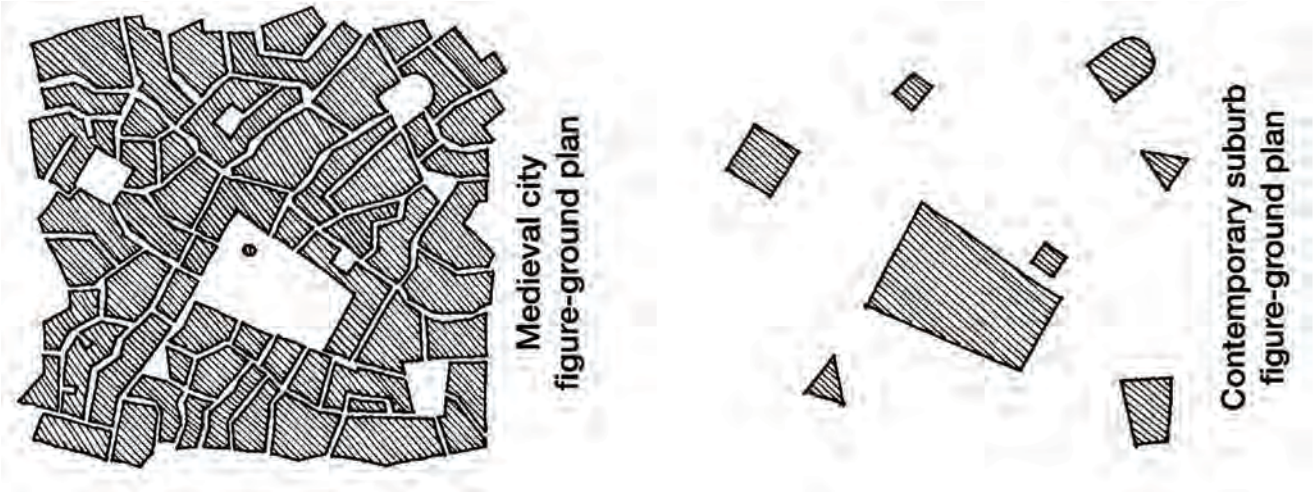


FIG 4.2: TRADITIONAL AND MODERN URBAN FORM. IN THE TRADITIONAL CITY, URBAN BLOCKS DIRECT MOVEMENT AND ESTABLISH ORIENTATION; IN THE MODERN CITY, THE FRAGMENTARY AND CONFUSED STRUCTURE CREATES DISORIENTATION (FREDERICK, 2007: 7).

Mathew Frederick, architect and author, believes that, *"We move through negative space and dwell in positive space. The shapes and qualities of architectural spaces greatly influence human experience and behaviour, for we inhabit the spaces of our built environment and not the solid walls, roofs, and columns that shape it. Positive spaces are almost always preferred by people for lingering and social interaction. Negative spaces tend to promote movement rather than dwelling in place." (Fig 4.3) & (Fig 4.4)* (Frederick, 2007: 6).

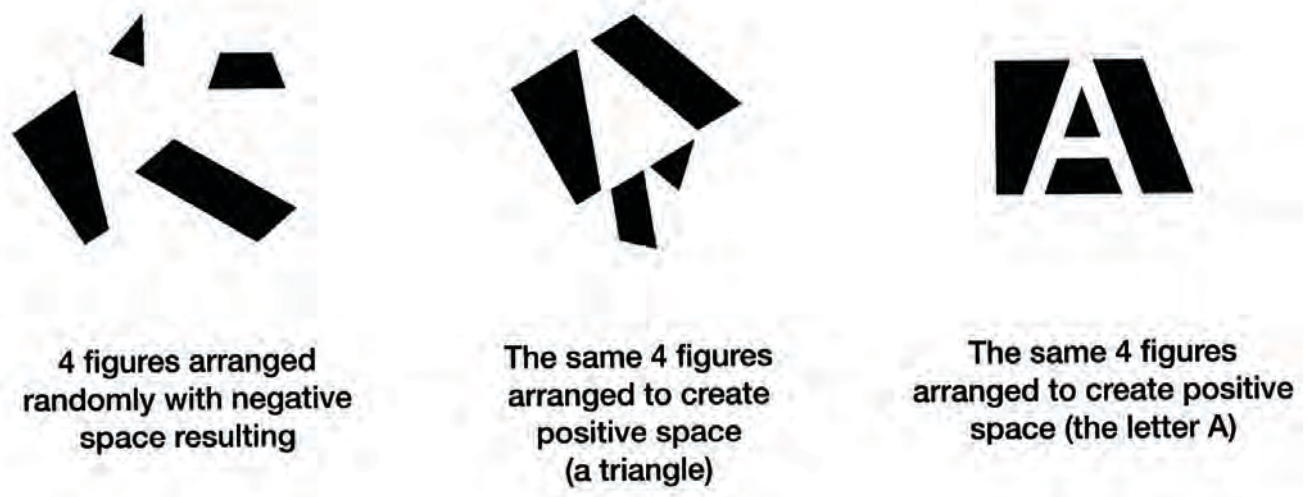


FIG 4.3: DIAGRAM COMPARING POSITIVE AND NEGATIVE SPACE (FREDERICK, 2007: 3).

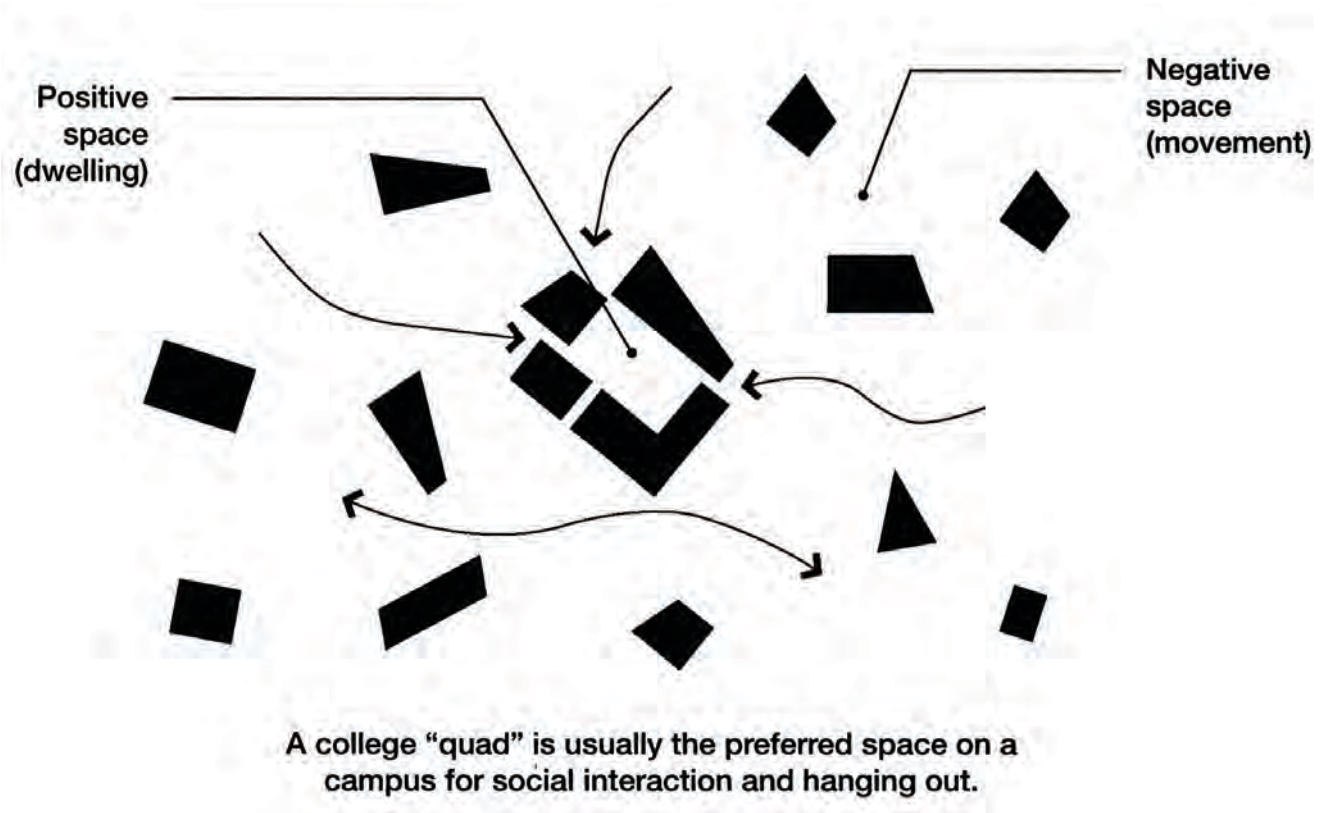


FIG 4.4: DIAGRAM INDICATING POSITIVE SPACE FOR DWELLING AND NEGATIVE SPACE FOR MOVEMENT (FREDERICK, 2007: 6).

As seen in the figure ground study of the Kings Park precinct (Fig 4.5), the urban grain seems to be fragmented in the precinct. The large tracks of sparse and underused land contrast to the dense urban fabric of the city and surrounding precincts. The goal would be to create a gradual transition between the dense surrounding precincts and Kings Park, while increasing density of the Kings Park complex to maintain edge continuity. Bearing in mind that large areas are needed to accommodate sporting audiences and their movements and maintain the natural park like environment. The adjacent road patterns will mark the position of important future junctions and where roads would be carried through to link existing precincts of the city. By sub-dividing the site into smaller blocks with the use of pedestrian and vehicular routes, it will increase the permeability, accessibility and created better sized lots for development. By following the existing, strong axes, it will provide important visual permeability for better legibility and orientation within the public domain.

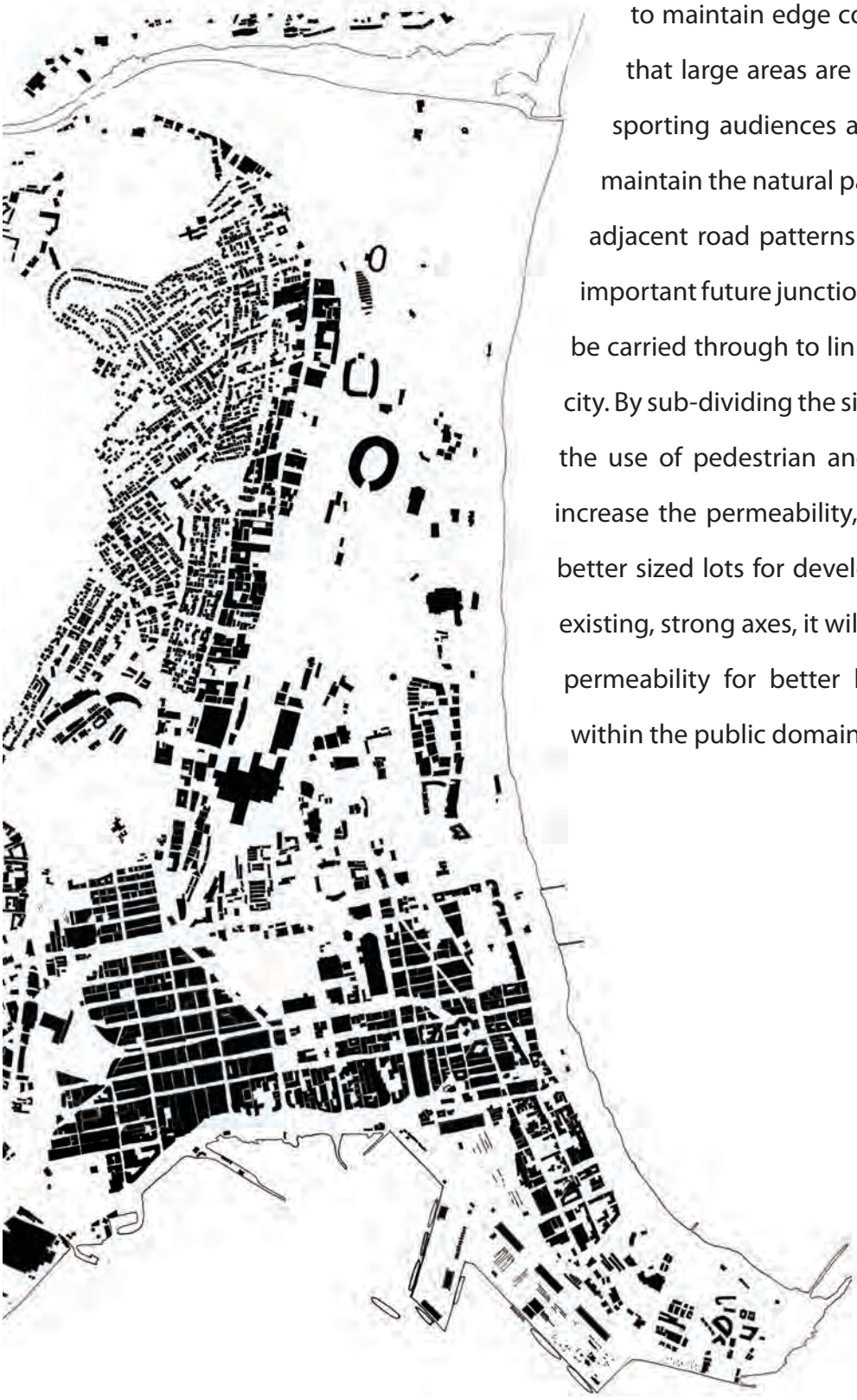


FIG 4.5: FIGURE GROUND STUDY OF THE KINGS PARK PRECINCT AND SURROUNDING CITY FABRIC.

Linkage Theory: is concerned with connections between parts of a city. These connections or links take the form of pedestrian ways, streets, linear open spaces or other elements that physically link the site to the city. These serve as vibrant movement channels through the fabric of the city in order to link together different nodes of activity, thereby creating a network of interconnected nodes. In this approach the dynamics of circulation and permeability become design generators for urban form, with the emphasis on movement between various nodes. "Linkage is simply the glue of the city", enabling various activities to function cohesively (Trancik, 1986: 106).

In order to make this links between important destinations, various barriers or gaps need to be identified in the precinct which prevents linkage between surrounding nodes and buildings. In the context of Kings Park, the barriers come in the form of freeways and railroad lines running in a north-south direction, making east-west connections difficult (Fig 4.6). At a micro scale permeability through the precinct is made difficult due to palisade fencing throughout the area and the Virgin Acitve's parking lot (Fig 4.7). Plans should adhere to the notion that the Kings Park precinct is inherently a public asset, it is essential that the area is optimised for accessibility by the public and link to the city as a whole. Establishing a range of connections would allow easy access to all facilities and ensure that the precinct will become an active part of the city.

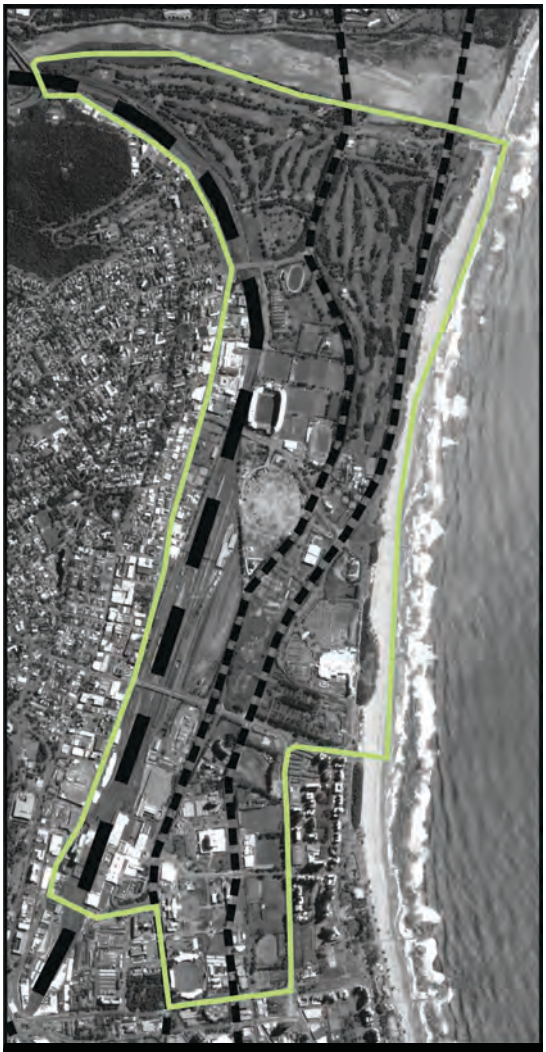


FIG 4.6: AERIAL PHOTO SHOWING BARRIERS CREATED BY THE FREEWAYS AND RAILWAY.

FIG 4.7: PHOTO OF BARRIERS CREATED BY THE PALISADE FENCING AND VIRGIN ACTIVE PARKING LOT.

Place Theory: Due to increased global flows, cities are becoming increasingly indistinguishable in terms their architecture, and thus rely increasingly on engineering an image of the city as a site to generate an identity independent of other similarly urban environments (Bale, 2004: 113). Van Den Bergh (1989: 3) has stressed, "*Far too much of our city [Durban] seems to be part of somewhere else. No specific place, just some anonymous other with buildings that satisfy some crude notion of practicality but which lack empathy with time, place and cultural context.*" He also feels that, "*A great city is one which its citizens can feel is theirs – a place which celebrates in its planning and fabric their particular traditions, creative abilities, whims, heroes and idiosyncrasies.*" These statements emphasize the necessity of creating a sense of place within Durban's built environment.

The significance of space and place is a central dimension to the topic of sport. Sport contests are often talked about as 'struggles over space', and the very notion of 'representative sport', invokes the centrality of places, which, through sport events, are represented at local, regional and national levels. There has been a tendency in recent times, to privilege space over place and to present the normative landscape of sport as one of 'placelessness'. The original 'natural' landscapes of sport are being replaced by synthetic simulations, 'drained of lived experience'. It has been suggested that sports sites are, indeed, becoming increasingly rational, a quality encouraged by the laws of sport which insist on playing areas being exactly the same as all others of their type. The broad prediction is that places of sport are becoming replaced by sport spaces (Fig 4.8) (Bale, 2004: 1).

FIG 4.8: INNOVATIVE WAY OF INCORPORATING NATURE INTO THE NORMATIVE LANDSCAPE OF SPORT (BROTO, 2005: 8).

In order to resolve this problem of 'placelessness' many architects and urban designers have looked to 'Place theory' for answers. Place theory responds to the human needs and unique historical, cultural and natural context of a region. The intention of this theory is to give the space additional richness and meaning by incorporating unique forms and details indigenous of the setting, thereby transforming a space into a place (Trancik, 1986: 97).

The distinction between place and space has been drawn by, architect Christian Norberg-Shultz, who said that 'a place is a space which has a distinct character'. Trancik also notes that a space will not become a place of any sort until it is given meaning, "*Space is a purposeful void with the potential of physically lining things; it only becomes place when it is given a contextual meaning derived from cultural or regional content…Place is unique, taking on the character of its surroundings. This character consists both of concrete things having material substance, shape, texture and colour and of more intangible cultural associations, a certain patina given by human use over time.*" Christian Norberg-Shultz notes that it is the task of the architect to create sites possessing meaning and memories, where he helps man to dwell (Trancik, 1986: 114).

Trancik strove to identify 'Lost spaces', to infuse them with life and meaning, and in doing so making a coherent whole of an area where a void existed. "Architecture must respond to and, if possible, enhance environmental identity and the sense of place...An integrated city will prevail if, in the process of transforming worn-out urban areas, we bring infill development into harmony with the predominant existing pattern." (Trancik, 1986: 114).

Urban designer, Kevin Lynch is another firm believer in 'Place theory'; he notes that a city must be unique and memorable in relation to its surroundings. Lynch perceived the city as a system that contains a set of organising structures of physiological significance to its inhabitants. He divided the city into five elements - paths, edges, districts, nodes and landmarks. These components, when applied to a design, allows the user to identify a legible image of the overall city or area. Paths; seen as streets, walkways, canals and railway lines, act as channels along which one moves. Edges; both active and passive, can define space and provide continuity within a particular area of the city or site. Districts; like Kings Park, are identifiable by certain characteristics such as texture, form, detail, activities and building type. Nodes are the strategic points along a path that facilitate a shift in direction, activity or structure. Unique points within a city or building may also be considered nodal points of interest. Landmarks, are a point reference within a city (like the new Moses Mabhida Stadium), usually allows

the viewer to identify a particular area and acts as a orientation device along a journey (Fig 4.9) (Trancik, 1986: 116,120-121).

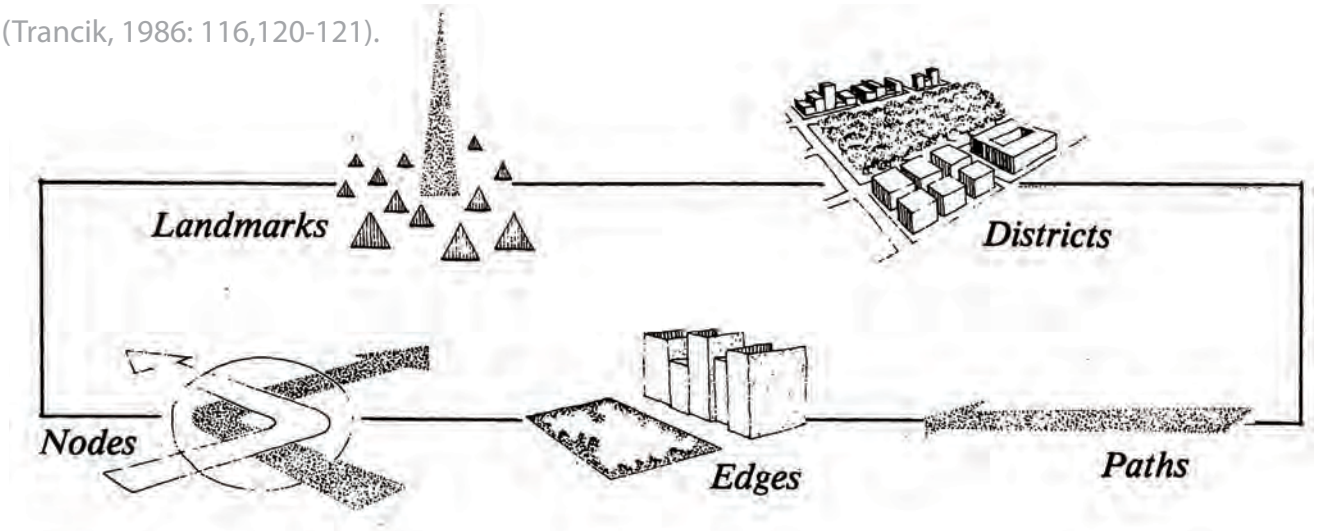


FIG 4.9: DIAGRAM SHOWING KEVIN LYNCH'S ORGANISING SYSTEM OF SPATIAL ELEMENTS WITHIN A CITY (TRANCIK, 1986: 121).

Trancik explained that, "The essence of place theory in spatial design lies in understanding the cultural and human characteristics of physical space." The cultural characteristics of Kings Park precinct are that of sport, recreation and event spaces. This means that the inherent human characteristics are those of togetherness, health, fun and spectacle. The area should therefore portray and reinforce this character in order to create a legible and identifiable environment. These meanings give manmade space an emotional content – a presence that is more than physical (Trancik, 1986: 114).

For Trancik, the criterion for how well a space is designed comes from the functional meaning and how well its physical shape accommodates social needs. Therefore, in the case of Kings Park the surrounding built form needs to enhance meaning of the city and precinct, while accommodating and relating to large sporting audiences. Trancik notes that, *"by eliciting the social criteria and translating them in the design process leads to the creation of social space appropriate to their activities that it contains. Ignoring human input leads to lost space."* (Trancik, 1986: 86).

Another important component to the regional characteristics of Kings Park is the surrounding natural environment of the river, harbour, beach and lush vegetation. These elements should be conserved and enhanced in future developments, which make the most of their inherent beauty and possibilities. Strategies may include; reintroducing the natural watercourse back into the city, maximising views to the ocean, incorporating stringent greening principals into the urban design and architecture, and maximising access to various nodes by connecting the city via green 'arterial' links, thereby improving and enhancing existing conditions.

Conclusion: Each of these theories of Figure Ground, Linkage and Place holds its own value. But considering all three collectively is what contributes to a cohesive city. The key is, therefore, to overlay these theories in order to achieve a successful urban framework for the Kings Park precinct (Fig 4.10). This will give a clear structure of solids and voids, create connections with surrounding precinct, respond to the human needs and unique elements of its context. This will result in a truly integrated precinct within the surrounding urban fabric (Trancik, 1986: 98).

Trancik has suggested five guidelines when infilling lost space (Trancik, 1986: 229):

- Maintain continuity of the street wall.
- Respect the existing silhouette of buildings and landscape.
- Prevent building masses that are out of scale.
- Match or compliment materials.
- Enhance patterns of public space use.

Trancik's theories will be further discussed in chapter 7, under "Urban Design Goals and Objectives" on page 205, where they will be applied to the Durban context.

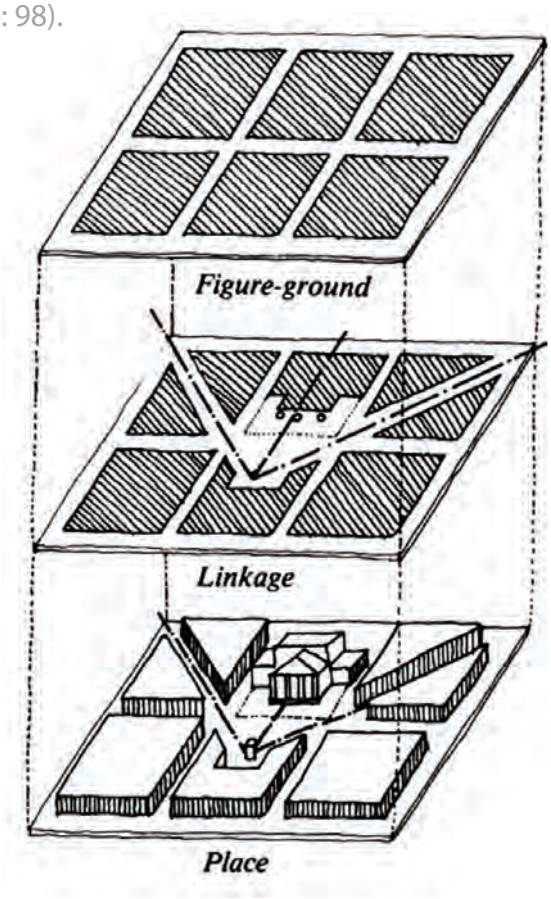


FIG 4.10: DIAGRAM OVERLAYING THEORIES OF FIGURE GROUND, LINKAGE AND PLACE THEORY (TRANCIK, 1986: 98).

In the literature review it was seen that the Kings park precinct has developed over time into a primarily sports and recreation orientated precinct. Trancik has said that, *"Responsiveness to the historic evolution of a place will avoid superficial repetition and a retrogressive, cosmetic treatment that does not respond to the spirit of the times."* Therefore, the existing urban fabric in relation to the proposed plans will provide the best suited framework for future growth. However, he asserts that certain spaces will require "remedial intervention" due to improper planning and lack of vision in the past. This is precisely what has accrued in the case of the Kings Park precinct. In order for the precinct to function sustainably, various uses need to be entwined with the overall primary function of sport and recreation. This notion mixed uses will be discussed under the next heading.

4.1.2 Compact - Mixed Use Cities

As seen in the analysis on (page 47), the Kings Park complex has been unsuccessful as it has not considered life after sports events and the area remains a sparsely developed and underutilized tract of land. This results in an area of the city which is dull, lifeless, unsafe and uninviting.

The notion of a compact-mixed use city development will therefore be discussed to establish the benefits it has in creating a safe, well used, sustainable environment which is vibrant at all times. Durban City itself recognises the underpinning concepts of a mixed use city. The Integrated Development Programme of 2006 asserted that, "*By connecting actions, resources and expenditure across the metropolitan area, we will unlock sustainable growth, whilst ensuring that we address the inequitable, inefficient and unsustainable consequence of past development patterns...Sporting events have been identified as one of the key strategies in the promotion of the City and Province. However, these events cannot work in isolation and be expected to be the sole means of economic development*." The best urban places offer a variety of uses, activities and experiences: living, working, shopping and playing all gain from being linked as opposed to being zoned separately (Stewart, 1994: 6).

The segregation-orientated planning of Durban was primarily due to South Africa's past apartheid policies, where separation was the goal, not function. The result was a sprawling, low-density city divided into mono-functional areas which separated groups of people according to class and race (COX Architects & Planners, 2004: 1). In order to achieve an integration-orientated city, it is important to examine the compact city structure of nearly all old medieval cities. These cities assembled events and people in a clear pattern. Public spaces were the most important elements in the city plan and all functions were located alongside the streets, encouraging interaction and communication (Fig 4.11). Such city structures are gaining a place in new projects throughout the world where streets and squares have again

FIG 4.11: MEDIEVAL CITY OF BREDA, THE NETHERLANDS WITH ITS VIBRANT STREET LIFE AND PUBLIC SPACES.

become the main elements, around which all functions are located. In old medieval cities, pedestrian traffic dictated a city structure where merchants and craftsmen, young and old, rich and poor, lived and worked side by side, where there was a close, interwoven pattern of activities (Gehl, 2001: 87).

In 2005, for the first time in human history, more people live in urban areas than in rural areas. Unfortunately, this massive growth in cities is often at odds with the natural environment. As more natural and rural lands give way to suburban houses and strip malls. This increases commuting time-and, by extension, the consumption of fossil fuels-increases, and precious public space dwindles as more land is devoted to highways and parking lots (Fig 4.12) (Gissen, 2002: 6) . Therefore this generation must be committed to the task of bringing the urban areas into balance with the natural environment and preserving the remaining natural landscape. Richard Rogers and many other urban designers and theorists agree that the compact city is the most sustainable urban form, in terms of environmental, economic and social conditions (Rogers, 1997: 27). Urban compaction by virtue of its density, generates the required threshold (people per hectare) to make services such as public transport feasible. The many key benefits of a compact city over urban sprawl include: reduced energy consumption, more efficient and well used public transport services, shorter journey times, the re-use of infrastructure and previously developed land, a rejuvenation of existing urban areas, a higher quality of life, the preservation of green space, the creation of an environment which enhances business and trading activities (Jenks, 1996: 56).

FIG 4.12: CITY DOMINATED BY THE AUTOMOBILE (ROGERS, 1997: 72)

Roger's stresses that, sprawling, single-function development and the dominance of the car should be substituted for compact, mixed use developments designed around an efficient public transport system (Fig 4.13). This transport system and mixture of uses, brings a variety facilities within convenient reach of the community, which means a reduction in car use and its ability to undermine community life. Transportation contributes towards a quarter of the cities energy consumption. Fewer cars means less energy consumption, congestion and better air quality which encourages walking and cycling which promote a healthy lifestyle within the community. Due to this lifestyle there is more face to face contact in the public realm, more friendships and associations born, forming a lively community orientated society (Rogers, 1997: 168).

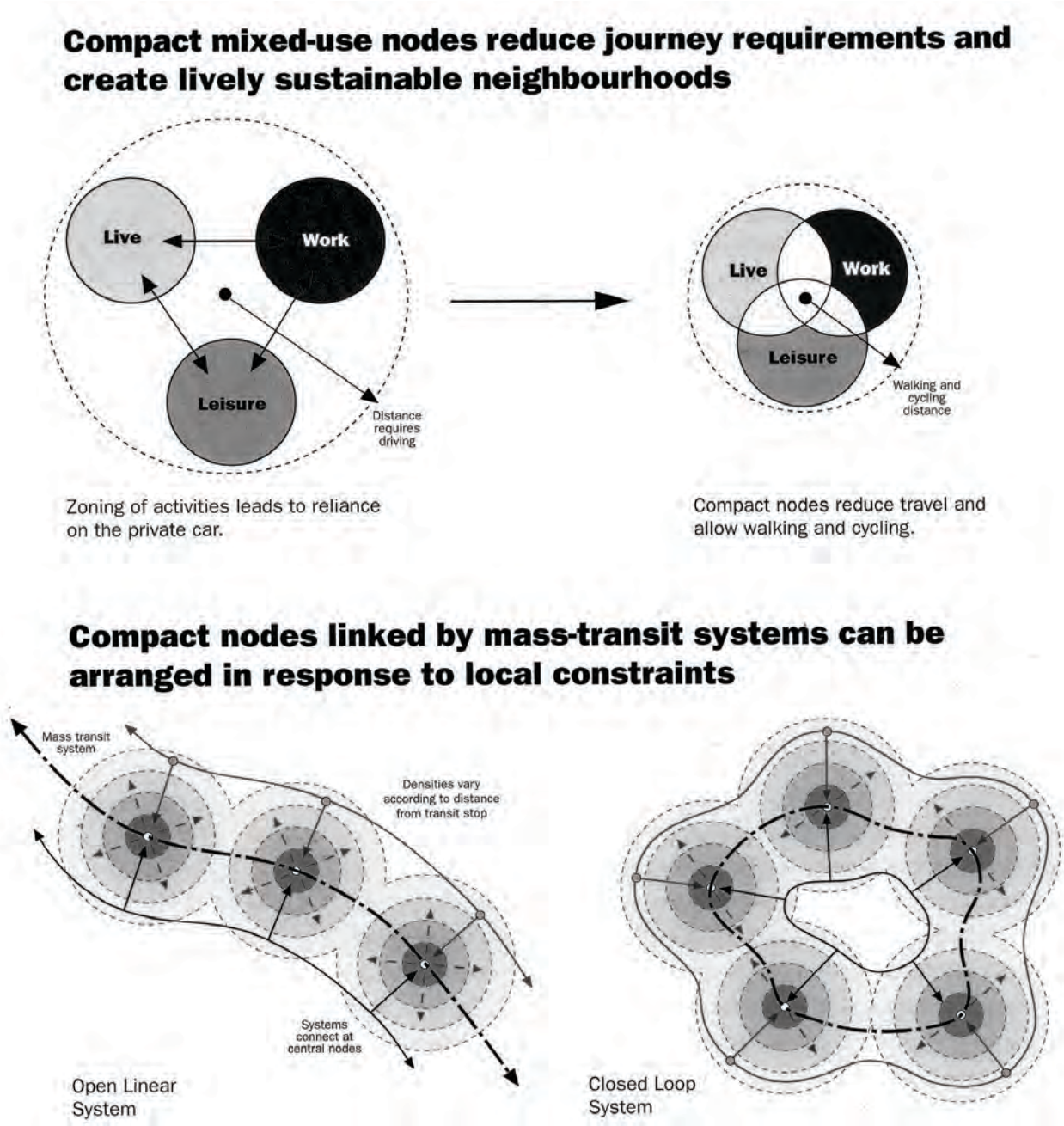


FIG 4.13: INTEGRATING PUBLIC TRANSPORTATION WITH A MIXED USE COMPACT CITY (ROGERS, 1997: 39).

Rogers suggests that one of the best ways to achieve sustainability in a large-scale project is to spread energy use over a 24 hour period by creating a mixture of uses within a single structure. An office and hotel room could share an energy source, since one uses energy predominantly during the day and the other at night. Similarly, instead of relying on power stations, local systems could be employed, reducing energy lost between the power creator and the point of dispersal (Gissen, 2002: 173).

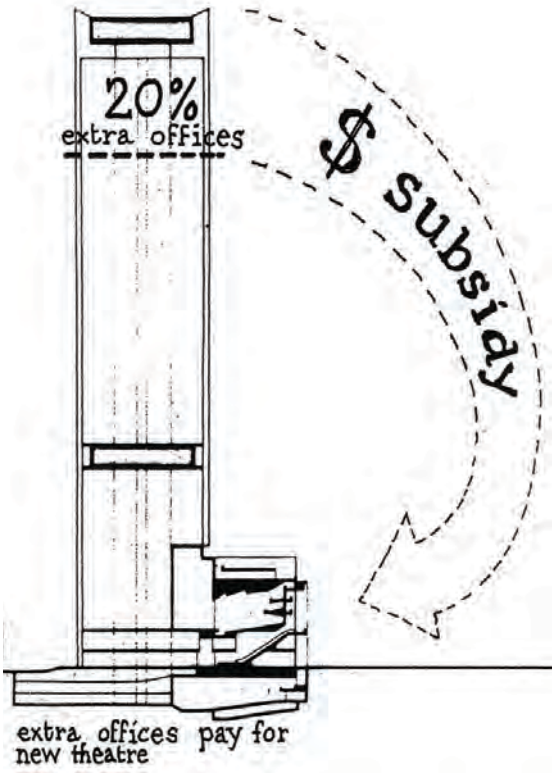
In the Kings park precinct, activities and people are dispersed because buildings are far apart, this facilitates excessive sidewalk and road connections, creating oversized open areas which minimises the establishment of active and better used public spaces. Architect and author Steve Parnell notes that, "Architecture needs activity like a sentence needs a verb." However, in order to achieve active, vibrant and well used spaces, buildings and functions need to be compact; to minimise the distances for pedestrian traffic, to maximise the use of facilities and infrastructure (Gehl, 2001: 87 & Parnell, 2009: 191).

It is important that the large passive green spaces of Kings Park do not become destinations unto themselves, but rather connect destinations. Cities that have relied too heavily on "greening" their cities without mixing uses that attract people for different reasons at different times, reduces the inherent vibrancy of the place, which in turn affect the surveillance and safety of the area. Some of the world's most successful cities such as Helsinki, Stockholm and Sydney, use parks as connective tissue to link major destinations together (Kent, 2006: 2)

According to Gehl, when buildings have long facades with few entrances, events are dispersed (Fig 4.14). However, by dimensioning both streets and squares realistically in proportion to the range of senses and the number of people that will be using the spaces, events can be assembled. When units are narrow and there are many doors it enhances street life and pedestrian activity, as people do not wish to walk long distances. Having many narrow, deep buildings along sidewalks and pedestrian routes avoids the problem of "holes" or "lost space". This dense continuous urban fabric should be designed to engage with surrounding public space. People's image of and reaction to the space is largely determined by the way it is enclosed. Dense edges reinforce the visual quality of enclosed space. In today's cities new frontage onto public space must often be created to fill in the gaps' which break up the consistency of the urban wall facing streets and squares. Continuity of the wall is important for achieving lateral enclosure and creating the setting for street-level activities appropriate to the area being redesigned. All functions on ground floor should add to the activity of the precinct,

which is important in creating a successful and walkable precinct which connects destinations (Gehl, 2001: 97 & Trancik, 1986: 18, 220). Creating a walkable precinct also entices people to travel by foot or bicycle rather than relying exclusively on the car. Major public spaces, like Kings Park are noticeably enhanced when there is limited vehicular access. Walking and cycling are an important part of the transportation mix, and many of the publicly successful precincts feature pedestrian promenades and bike lanes. People are more at ease when unrestrained by cars or parking lots, allowing activity to thrive (Fig 4.14) (Kent, 2006: 1).

FIG 4.14: CONTRAST BETWEEN SUCCESSFUL AND UNSUCCESSFUL PUBLIC SPACES IF QUALITY CRITERIA ARE NOT MET (GEMZØE, 2008: 34).



When mixed use developments are employed, borders between different functions and community groups are removed, this allows activities to function symbiotically and strengthen one another. When the ground floor is used for retail it creates a lively, vibrant street, which in turn creates a better living environment for the residents above as they have visual and close physical contact with city life and facilities. Retail and office space incorporated into a residential block allows for cross-subsidisation (Fig 4.15). This means that the more profitable retail and office components pay more rent, which means the residential rentals become more affordable (Bentry, 1985: 29).

FIG 4.15: DIAGRAM OF CROSS SUBSIDISATION (BENTLY, 1985: 29).

Gehl notes that, the heights of these buildings is also important, as contact with the vibrant street is lost if the buildings are too tall. However, if the heights are too low it contributes to urban sprawl as space is not well utilised vertically, the building footprint increases and more space is required. There is a marked decrease in the ability to connect with the ground floor, with anything above the fifth floor feeling out of touch with ground level events (Fig 4.16). In contrast, low-rise buildings of up to 5 floors along a street are in harmony with the way in which people move about, and the way the senses function. This scale of building reduce the need for an expensive lift system, and residences don't feel isolated from the city below (Gehl, 2001: 100).

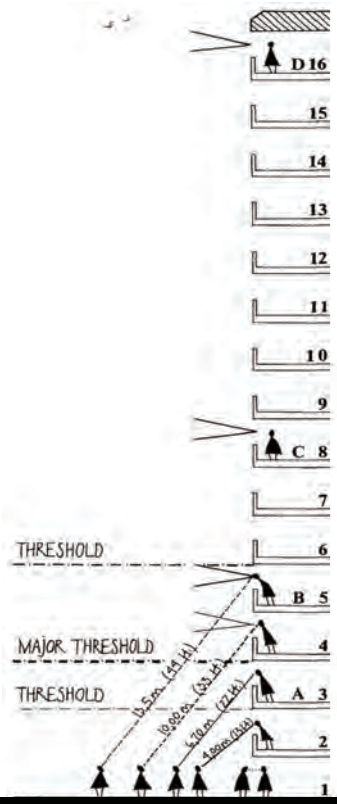


FIG 4.16: RELATION BETWEEN FLOORS AND THE STREET (GEHL, 2001: 100)

By incorporating a mixture of uses into a precinct, it encourages 24-hour activity as the variety of activities take place at different times, thereby staggering the activity throughout the day. This type of development will ensure a vibrant, safe and enjoyable public realm. The residential component to development is important, however should not dominate the Kings Park complex (Fig 4.17).

Sports precincts should be full of activity day and night with festivals, sports events, firework displays and concerts. The residential components should therefore be positioned strategically to allow for this and generate the required threshold to create a bustling public realm while not disturbing the residences. A place fused with activity, during both day and night, draws people in and brings the area to life through public interaction. This creates vibrancy and surveillance which intern creates safety and security. This will reduce the need for fences and increase accessibility to the area. The sight of action and interaction between people encourages the use of these positive spaces and in turn, the local community feels personally responsible for their preservation.

It can therefore be said that, to avoid the segregation-orientated planning of Durban and the sparse, underused and mono-functional precinct of Kings Park, it is important to incorporate a dense mixture of uses in the precinct. This will create a vibrant, safe and sustainable precinct which is active throughout the day.

FIG 4.17: PHOTOS OF ALMERE, A MIXED USE CITY DESIGNED BY REM KOOLHAAS WHICH DIVIDES THE CITY INTO HORIZONTAL LAYERS. THE TRANS-PORTATION NODE IS ACCOMMODATED IN THE BASEMENT LEVEL, ALLOWING THE MIDDLE LAYERS TO BE FREE OF VEHICLES. THIS CREATES A VIBRANT PEDESTRIAN ORIENTATED STREET WHICH PRIMARILY ACCOMMODATES RETAIL, RESTAURANTS AND OTHER ACTIVITIES WHICH ADD TO THE VIBRANCY OF THE PUBLIC REALM. THE LAYER ABOVE THE STREET IS RESERVED FOR OFFICES, BUSINESSES AND SECOND FLOOR RETAIL. THE TOP LAYERS ACCOMMODATE THE RESIDENTIAL COMPONENT WHICH IS SEMI-DETACHED FROM THE LAYERS BELOW, CREATING AN ENVIRONMENT WHICH IS PEACEFUL AND QUITE. THE LANDSCAPED ROOF AND ROCK-LIKE CLADDING CREATE THE APPEARANCE OF THE CITY BELOW BEING CARVED OUT OF THE EARTH, WHIST EMPHASIZING THE VARIOUS LAYERS.

4.1.3 Life Between Buildings and the Public Realm

The aim of this section is to investigate what makes the public realm within cities vibrant, safe and enjoyable spaces. The theories of Jan Gehl and others will be explored to determine their thoughts on what constitutes towards creating attractive public spaces. These theories will be analyzed and interpreted for their application within the Kings Park Precinct.

Gehl notes that lively cities are much harder to accomplish in today's society. Circumstances for creating life in the city have changed because of modern lifestyles: smaller households, less physical contact due to electronic communications, dominance of the automobile and separated zoning principals of town planning. Fortified office parks, gated housing estates and megamalls have deserted the city, privatising public space and hollowing out the attractions of the street. This leads to less population density in the modern city, which has changed the circumstances for life in the public spaces. One of the problems with planning and architecture today is that the spaces between the buildings are really designed. A building tends to become, in itself, more of an object, separate from its context. Many buildings look like fortresses of steel and glass and the cities are dominated by expansive parking lots. As a result, pedestrian traffic and much of the city life is gradually disappearing (Gehl, 2001: 71 & Trancik, 1986: 9). The cities of South Africa are now places where inhabitants pass like tourists rather than fellow citizens (Foster, 2008: 67).

The size of the buildings, the large spaces that are 'left over' between the buildings and the cold shiny facades do not draw people nor do they address the adjacent open spaces. Much thought is put into what goes on within the buildings, but little is done to address their surroundings or what could potentially take place around. Gehl insists that '…the major function of communal spaces in architecture is to provide the arena for life between buildings', here people are allowed to interact with one another in the in-between zone and provide valuable meeting places to connect the diverse population surrounding the precinct (Gehl, 2001: 19). To Gehl, design always begins by analysing the space between the buildings. "Once the desired human dimension is established, a spatial strategy for public space is formed. Finally work is done to shape the built environment, ensuring that the relationship between people and buildings supports public life." In other words, Jan Gehl's theory is to consider the 'life' then the 'spaces' and finally the 'buildings' (Fig 4.18) (Gehl, 2001: 71).

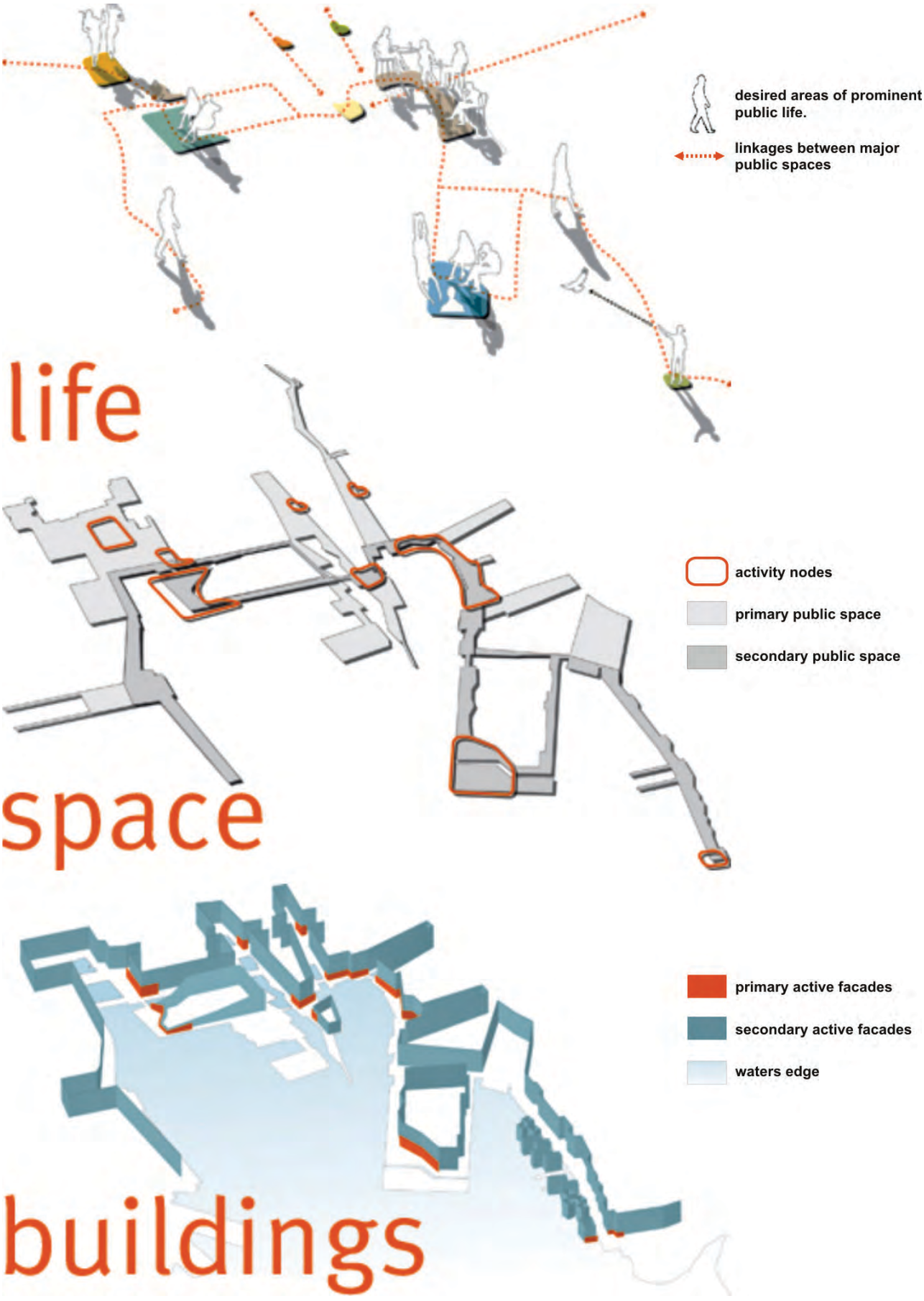


FIG 4.18: GEHL'S THEORY IS TO CONSIDER THE 'LIFE' THEN THE 'SPACES' AND FINALLY THE 'BUILDINGS' (GEHL, 2005: 1).

Gehl Notes that it is unreasonable to expect to create entire cities bursting with street life in many of the modern, sprawling cities, but there is always opportunity to create pleasant areas for walking, and squares and plazas that are inviting spaces in which to meet, linger and stay. In examples where people have been invited to use public spaces, the city life increases, which proves that modern city dwellers are interested in interacting with others. The city provides the opportunity for chance meetings and informal gatherings, and in this way the city has a new important function (Gehl, 2001: 72). The possibility of meeting neighbours and co-workers in relation with daily comings and goings offers opportunity to establish a greater sense of community life through acquaintance in a relaxed and undemanding way. A successful precinct should therefore provide street furniture for the possibilities of sitting, standing and socialising (Gehl, 2001: 13).

A classic example is the 1994 restoration of the Champs-Elysees in Paris, which helped the boulevard regain some of its charm as a promenade (Fig 4.19). New street furniture was added and the pavements were widened from 12m to 24m to provide adequate space for cafes and vending. Other improvements were surfaces textures, an avenue of trees provides pedestrians with a buffer from vehicular traffic and new underground garage to appease parking problems. Both new pavements are now well used, and better conditions for pedestrians have resulted in more city life (Kent, 2004: 1).

FIG 4.19: VIBRANT STREET LIFE OF THE CHAMPS-ELYSEES IN PARIS, AFTER THE RESTORATION (BERTOLET, 2008: 1)

The focus must be on careful attention to detail and people who will be using this space. Jan Gehl believed the place must be protected from risk and unpleasant situations. It should provide possibilities for strolling, sitting, standing, observing, listening and talking. He feels that places should offer challenges, architectural visual qualities, good climatic conditions and a sense of human scale. With every creation or upgrade of a public space Jan Gehl posed several questions in order to achieve a successful public space:

- What are the problems with the space?
- Who would use the space and what activities are likely to take place?
- What are the particular qualities of the space?
- What characteristics must be present so that users can get the most out of a particular space?

Gehl evaluates existing public spaces using a system of 12 quality criteria broken up into three zones: protection, comfort and enjoyment (Fig 4.20). Once this analysis has been done he proposes interventions which would benefit the users of that particular public space (Gemzoe, 2008: 21).

When single public spaces are upgraded and basic measures of human comfort are catered for, new patterns of public life arise. Much richer and varied city life results when the public are invited to utilize the public spaces within the city. Gehl emphasizes the importance of gradual transformation in urban redevelopments, in order to make interventions sustainable and to give people time to settle in to the physical changes, adjust their life styles, and experiment with the new ways of using the city. Gradual transformation allows for greater flexibility in the design process. After experiencing the positive and negative aspects of the space, changes can be made (Kent, 2005: 1).

Through this exploration it can be said that, creating a quality environment for people is paramount and must be considered before anything else, in order to achieve a lively and sustainable public realm. Successful public spaces are not created solely by form, design and choice of materials. All aspects are to be considered: starting with life, then space and finally the built form, to ensure the creation of beautiful and useful public spaces.

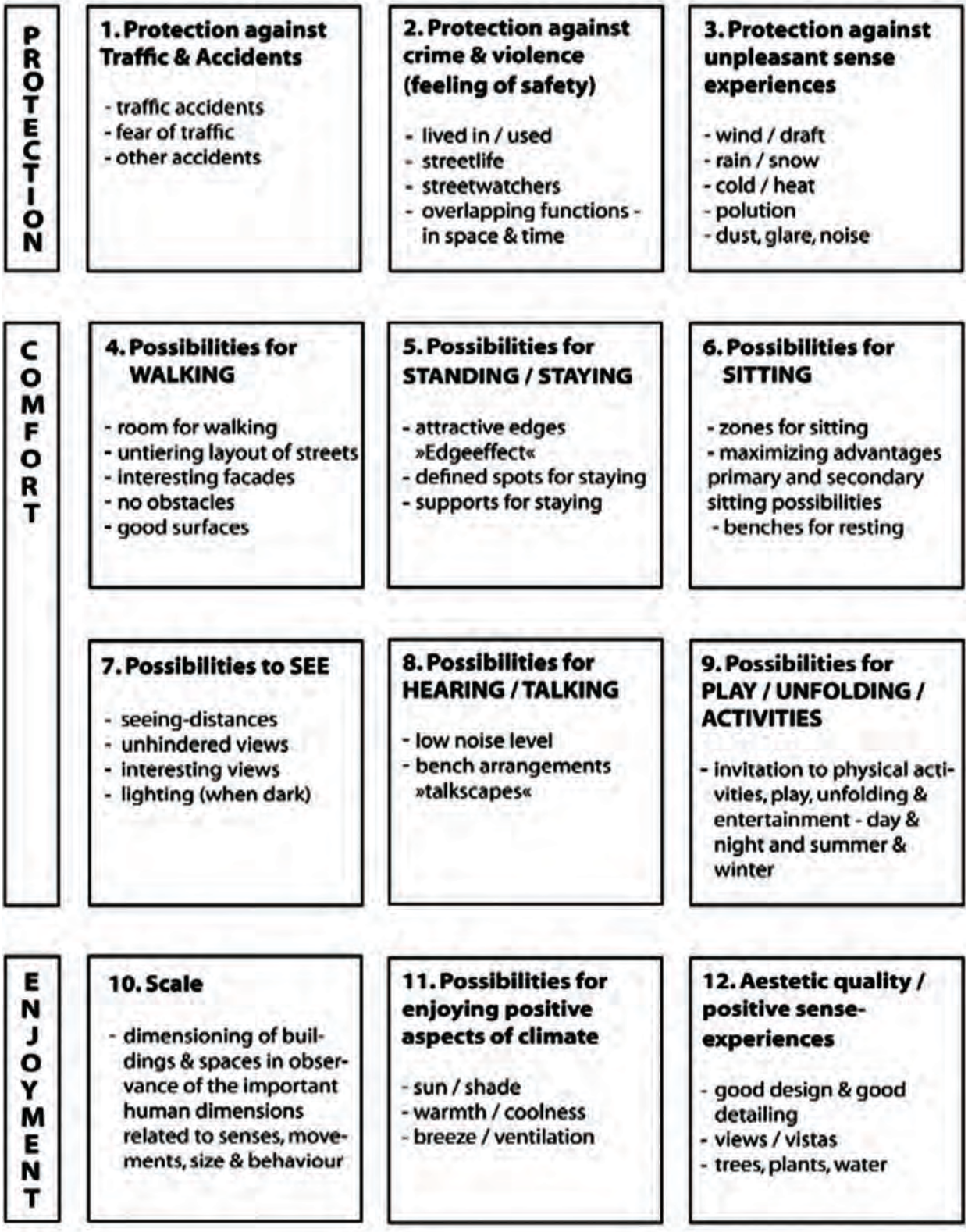


FIG 4.20: GEHL'S 12 CRITERIA FOR SUCCESSFUL PUBLIC SPACE (GEMZØE ,2008: 48).

4.1.4 Urban Catalysts

As seen in the previous chapter (page 44), the 'Beyond 2010 Strategy' for Durban identified three catalytic interventions for the precinct, comprising of the new multi-purpose stadium, HPC and Indoor arena. This section examines the significance of catalytic projects and what they entail.

Urban catalysts are new redevelopment strategies comprised of a series of projects that guide and drive urban development, increasing the number of users in an area in order to revive the fabric of a particular city. Past redevelopment efforts, such as urban renewal and large-scale redevelopment projects, have often compromised the authenticity of cities. The difference between the urban catalyst and these redevelopment strategies is that catalytic redevelopment is a holistic approach, not a clean-slate approach, to revitalizing the urban fabric (Bohannon, 2004: 2 & COX Architects & Planners, 2004: 2).

Sternberg (2002: 30) notes that for a catalyst to be successful, it needs to: generate social and economic activity, be located near commercial establishments (single or mixed use), be within walking distance of other developments, and have strategically planned entrance and exit points that will shape pedestrian movement patterns. Catalysts need to be within walking distance of each other or be linked by public transit to maintain a concentration of activity. This is vital because once a person gets into their car they are far less likely to utilize a nearby venue, since their range of convenience has expanded due to the automobile. Therefore is it imperative that catalysts be arranged in such a way as to capitalize on pedestrian movement. Street vitality is very important in attracting new people to an area, thus the flow of people from a catalyst to linked venues must generate a healthy density of pedestrians (Bohannon, 2004: 11).

Sternberg (2002: 33) describes catalysts as essentially being "an activity generator" or "anchor". Sternberg (2002: 36) identifies four ways in which catalysts can facilitate surrounding developments. Firstly creating pedestrian traffic is the most important way that a project can encourage development. This occurs when a catalyst acts as a primary destination or "anchor" that draws people to an area, creating demand for secondary uses that fuel adjacent developments. This strategy can successfully provide a variety of uses that will extend the life of a development. Secondly, catalysts need to be properly designed and linked to its surroundings visually and physically. Thirdly, a catalyst can serve to improve the appearance of an area by complementing a streetscape. Thereby changing one's

perception of an area if it survives in an area previously noted as derelict. Lastly is the relevance of the project relative to its location—for example, a stadium in a district known for its sport (Bohannon, 2004: 10).

A comprehensive analysis of the project context is necessary to insure that an urban catalyst responds to its surrounding setting with authenticity. Critical contextual considerations comprise of morphological, perceptual, social, visual, functional, and temporal factors. Morphological factors focuses on the layout and form of streets and the pattern of urban blocks (See "Figure Ground Theory" on page 53). Perceptual factors deal with how people observe, understand, and add meaning to the urban environment (See "Place Theory" on page 57 & "Creating a Meaningful Architecture" on page 80). Social factors, address key issues surrounding the relationship between space and society (See "Theory of Cultural Mobility" on page 75). The visual factor focuses on the visual experience of the urban environment. Function strongly supports urban design as a design process; as design criteria must be met simultaneously to insure the design responds to its context. Time involves changes that unfold progressively; therefore designers need to understand the impact time has on places. This framework is helpful in understanding the complexity of the urban environments that form the settings for urban catalyst projects (Bohannon, 2004: 12).

It can therefore be said that the series of catalytic projects proposed for the Kings Park precinct would be a holistic approach to revitalising and reintegrating the area into the surrounding urban fabric. Instead of the new stadium becoming a freestanding Icon. The next catalytic projects will generate additional density, public space and surrounding activities to support it; thereby creating a successful collective space.

4.1.5 Theory of Cultural Mobility: Fan Parks

The quality of communal urban space is obvious in historical cities where public space was architecturally framed and scripted for various uses, however it is less explicit today, when neither private nor public architecture aspires to organize communal space (Foster, 2008: 64). From a South African perspective there has been little precedent for successful communal urban spaces, as public space has been about segregation not integration. This creates hostility between community groups as individuals do not understand other cultures or lifestyles.

However, due to the growing popularity of sport internationally, sport-scapes are beginning to generate new opportunities for communal public space within cities around the world. These public spaces are beginning to offer new opportunities in transgressing the boundaries of the segregated cities through South Africa. Public viewing areas or 'Fan Parks' are becoming some of the most significant locations of international contact; they have come to represent one of the most frequent sources of regular contact between people of different countries, cultures and lifestyles (Dunning, 1971: xviii & Nauright, 1997: 191).

First introduced in Germany in 2006 as accessible public spaces where fans could communally watch lives media transmissions (Fig 4.21), these Fan Parks also take on another life as informal public spaces of celebration and spectacle in which a new kind of decentralized and more performative relationship between the audience and the event emerges (Foster, 2008: 68).

FIG 4.21: STUTTGART FAN PARK 2006 (JESSOP, 2006: 1).

Although soccer has a fanatical following in South African, only a relatively small portion of the population has access to television, even fewer have access to the Internet, and only a fraction will be able afford tickets for the stadium matches (Foster, 2008: 68). Ticket prices serve to limit which South Africans can attend matches and forms another way to segregate the population. There are three million match tickets available for the event. As the host nation, with a population in excess of 40 million, South Africa would be considered lucky if it were to be given a million tickets. This places intense pressure on cities, and particularly host cities, to manage the masses of local and foreign fans that will not have access to match tickets. Even those that do will likely spend more time outside of stadiums than in them; as see during the 2006 FIFA World Cup in Germany, where about 18 million people watched games in Fan Parks, six times more than the number who watched games in stadiums (Moodley, 2008: 24).

South Africa is hoping to build on this highly successful concept of 'Fan Parks', providing the ideal opportunity to simulate the exhilarating atmosphere found inside stadiums during matches. FIFA President, Joseph Blatter stated that, "the 'FIFA Fan Fest' was an important part of the success of the 2006 FIFA World Cup and we believe that the 2010 FIFA Fan Fests, both in South Africa and in the seven other international venues, will bring an unprecedented experience to millions of football fans in South Africa and around the world." These 'Fan Parks' are essentially secure public outdoor venues transmitting live images of games played throughout the country and the world onto massive AV screens, providing a space for fans to watch the matches at no cost; making the event accessible to all. These public viewing areas will be interspersed with a range of entertainment and memorabilia, as well as local arts and craft which will be on sale. At the same time, giving a number of local artists and other entertainers an opportunity to perform on the global stage, thereby showcasing South Africa's unique and diverse arts and culture to the international community (Moodley, 2008: 24).

Forging common ground between fragmented community groups remains a major challenge in South Africa. These communal parks are seen as a positive initiative to the solution of this problem, as Maurice Halbwachs observed, what builds solidarity is shared lived experience. These new communal public spaces focus on the prospect of creating urban environments which facilitate "cultural mobility", i.e. places where people with different cultures and lifestyles can meet and share new experiences - spaces where a change of perception is possible (Foster, 2008: 68-69).

Fan Parks will become urban revitalisation projects aimed at uniting the historically segregated communities from surrounding areas. These public gathering spaces will accommodate many different people and lifestyles, acting as 'cultural melting pots' and becoming 'meeting rooms of the city' encouraging social change. They provide spill over area around the stadiums and an area for post match celebrations, even when a match is in another location. These public spaces become vibrant, festive public domains, bringing the events to the people. They become spectacles in themselves in which the event makes the space as much as the space makes the event (Foster, 2008: 68 & Moodley, 2008: 25).

These fan parks are not limited to Major events like the FIFA world cup. They would become a welcomed addition to the communal public space of the host cities, used for many local and international events. Fan Parks would provide the ideal opportunity to enhance the post event celebrations which are so popular within the Kings Park precinct. As well as creating a social gathering space for fans even when the home team is not playing on local soil.

There are three main problems when considering the design of Fan Parks: Firstly is the problem of how to transpose the excitement and experience of watching a live soccer match in a stadium into a space where all that exists are images and sounds of the game (in other words, managing the image-as-spectacle) there is the additional opportunity to configure a new kind of temporary/un-programmed public space which remains flexible and adaptable to various types of events (sport, art, culture, music etc.) (Foster, 2008: 68). This directs the architecture toward the fusion of the build form with media technology (Fig 4.22). Thereby, creating an architecture which is constantly changing and responsive to the surrounding urban spaces and events (see "Architecture as Media Technology" on page 137).

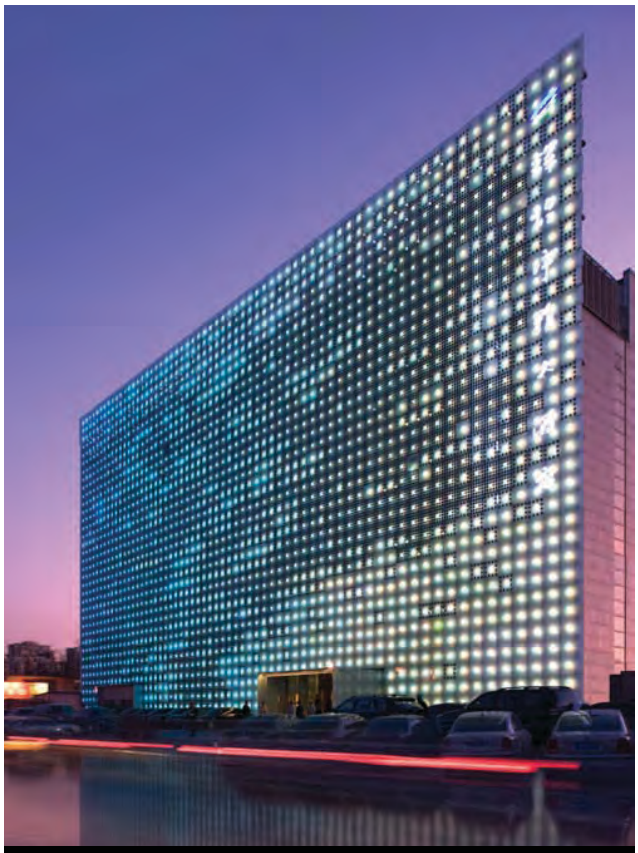


FIG 4.22: THE 'GREENPIX' ZERO ENERGY MEDIA WALL IN BEIJING REPRESENTS A NEW KIND OF COMMUNICATION SURFACE (GIOSTRA, 2008: 3)

The second design problem of these communal spaces is how get the masses of people to and from these zones. It is therefore imperative that these spaces are in close proximity to major public transport hubs and efficient infrastructural systems (Moodley, 2008: 25).

Fan Parks are small, unscripted projects that seem likely to generate a legacy attuned to the urban contexts in which they are located. They have become important sites for at the generation of identities for local, regional and national levels, while simultaneously representing nations and communities to the global audience (Dunning, 1971: xviii & Foster, 2008: 68 & Nauright, 1997: 191). This brings about the third problem of how to orchestrate the 'narrative of the event' and the 'narrative of the city', in such a way that the two might become fused in an iconic mediated image. This involves the fabrication and orchestration of informal and formal programmes in new combinations that, both practically and representationally, link the site to the rest of the city, South Africa and the world (Foster, 2008: 69). It is therefore important to look at place "Place Theory" on page 57 and "Creating a Meaningful Architecture" on page 80 in order to infuse the urban and architectural spaces with symbolic content and meaning.

As Trancik notes, extracting the social criteria of a particular area and translating them in the design process leads to the creation of social space appropriate to the activities in contains. Fan Parks respond to the needs of the local people whilst relating appropriately to the typology for the area. These devices will permanently expand the repertoire of public space within Durban as a whole. Becoming spaces of identity and unity, not as static images, but as generators of a new locally specific kinds of urban performance which portrays and integrates Durban's culturally diversity city (Foster, 2008: 69 & Trancik, 1986: 88).

Conclusion: These above theories will facilitate in the creation of an urban design for the Kings Park precinct, which will provide the necessary framework into which a HPC will be incorporated. The Urban Design theories of this chapter will be further discussed in chapter 7 under "Urban Design Goals and Objectives" on page 205, where they will be applied to the Durban/Kings Park context.

Some of the urban design principles which can be leant from in summery are:

Character and identity: To promote a sense of place in townscape and landscape by responding to and reinforcing locally distinctive patterns of development, landscape and culture.

Continuity and enclosure: To promote a compact urban fabric, continuity of street frontages and the enclosure of space by development that clearly defines private and public areas.

Quality of the public realm: To promote public spaces and routes that are attractive, vibrant, safe and work effectively for all in society.

Ease of movement: To promote accessibility and local permeability by making places that connect with each other and are easy to move through, putting people before traffic and integrating land uses and transport.

Legibility: to promote legibility through development that provides recognizable routes, intersections and landmarks to help people find their way around.

Adaptability: To promote adaptability through development that can respond to changing social, technological and economic conditions.

Diversity: To promote diversity and choice through mixed use developments that work together to create viable places that respond to local needs (Moor, 2006: 30).

Now that the context of the precinct has been considered, it is now time to examine how the built form of the HPC will respond to this surrounding context and its users. As seen in the urban design section on 'place theories' it is important for the build form to contribute to its surroundings and give meaning its unique context. It is for this reason that the following chapter will focus on creating a meaningful architecture which is responsive to both the users and surrounding context.

4.2 DESIGN THEORY: CREATING A MEANINGFUL ARCHITECTURE

Introduction

As Roger Trancik notes, "*It is the task of the architect to create buildings possessing meaning and memories which enhance the character of their surroundings*" (Trancik, 1986: 114).

However, architect and author, David Leatherbarrow believes that the current tendency in architecture is to separate identity and function, which has divided the interaction between the building, the user, and the environment. It is his view that many contemporary buildings either reflect a system of production or represent superficial styles from history and abroad (Leatherbarrow, 2005: i). The introduction of the detached, or 'free façade' altered the function of architecture as a mediator between interior and exterior creating a separation between the buildings programmatic interior and its formal exterior. This has allowed for more sculptural exterior coverings to be created and in many instances, emphasis is placed on form, without having to respond to the functional needs of the internal spaces (Fig 4.23). Leatherbarrow feels that this has resulted in a superficial architecture with a sense of immateriality and falsely perceived timelessness, as objects separate from nature (Leatherbarrow, 2005: 7 & Schonhadt, 2005: 7, 24).

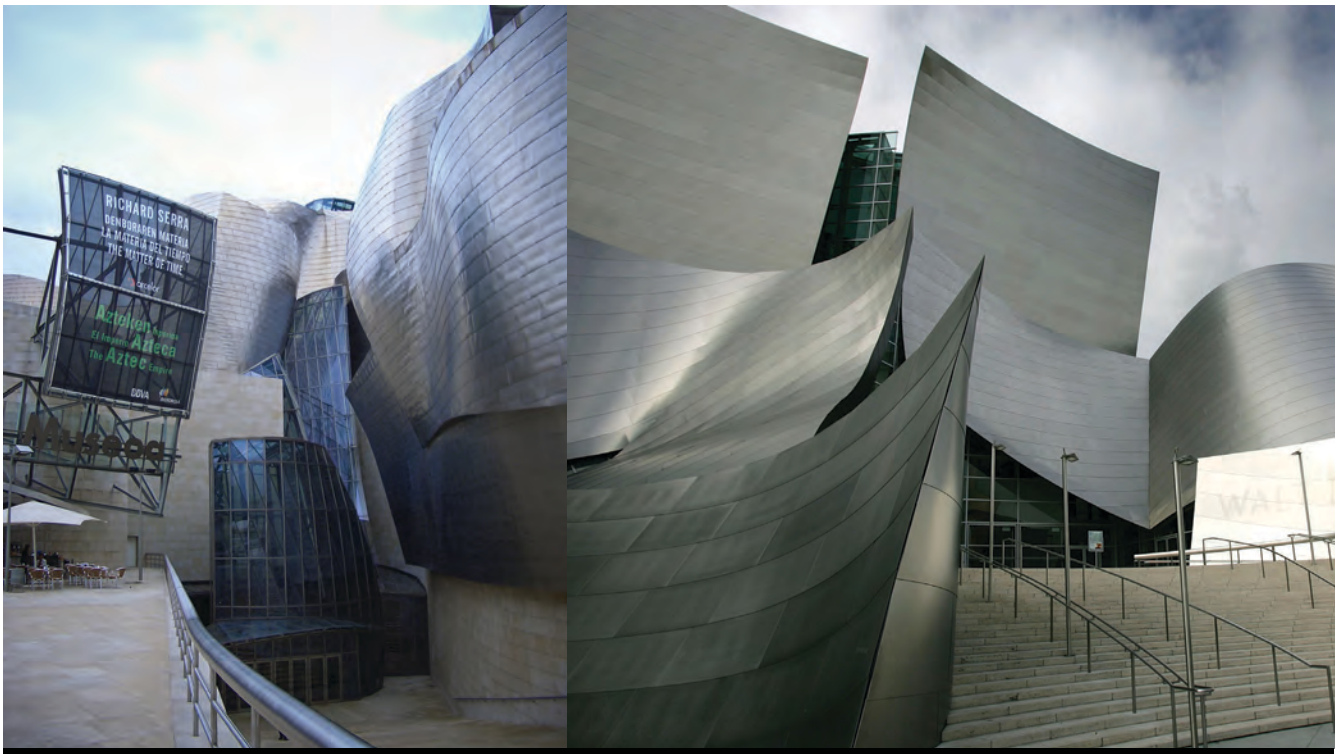


FIG 4.23: IMAGES SHOWING THE STARK SIMILARITIES BETWEEN FRANK GEHRY'S GUGGENHEIM MUSEUM, BILBAO AND HIS DISNEY CONCERT HALL, LOS ANGELS. SHOWING LITTLE REGARD FOR INTERNAL FUNCTIONS (CRAVEN, 2005: 1).

Through the consideration of these perceived problems it would make sense to explore functional meaning in architecture, which is directed toward creating a more meaningful architectural interaction between aesthetics (metaphysical) and function (technical), where building declares both its autonomy and in its participation in its surroundings (Fig 4.24) & (Fig 4.25) (Schonhadt, 2005: 1). Mathew Frederick, architect and author, believes that, "Good design solutions are not merely physically interesting but are driven by underlying ideas. An idea is a specific mental structure by which we organise, understand, and give meaning to external experiences and information. Without underlying ideas informing their buildings, architects are merely space planners. Space planning with decoration applied to "dress it up" is not architecture; architecture resides in the DNA of the building, in an embedded sensibility that infuses its whole" (Frederick, 2007: 14).

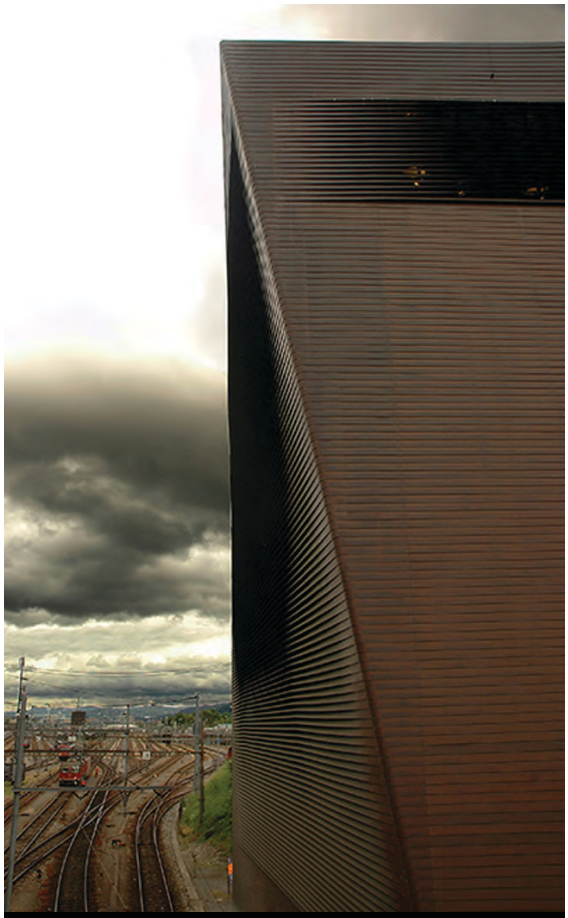


FIG 4.24: CENTRAL SWITCH YARD, DESIGN BY HERZOG & DE MEURON, BASEL, SWITZERLAND (MASOUDI, 2007: 1).

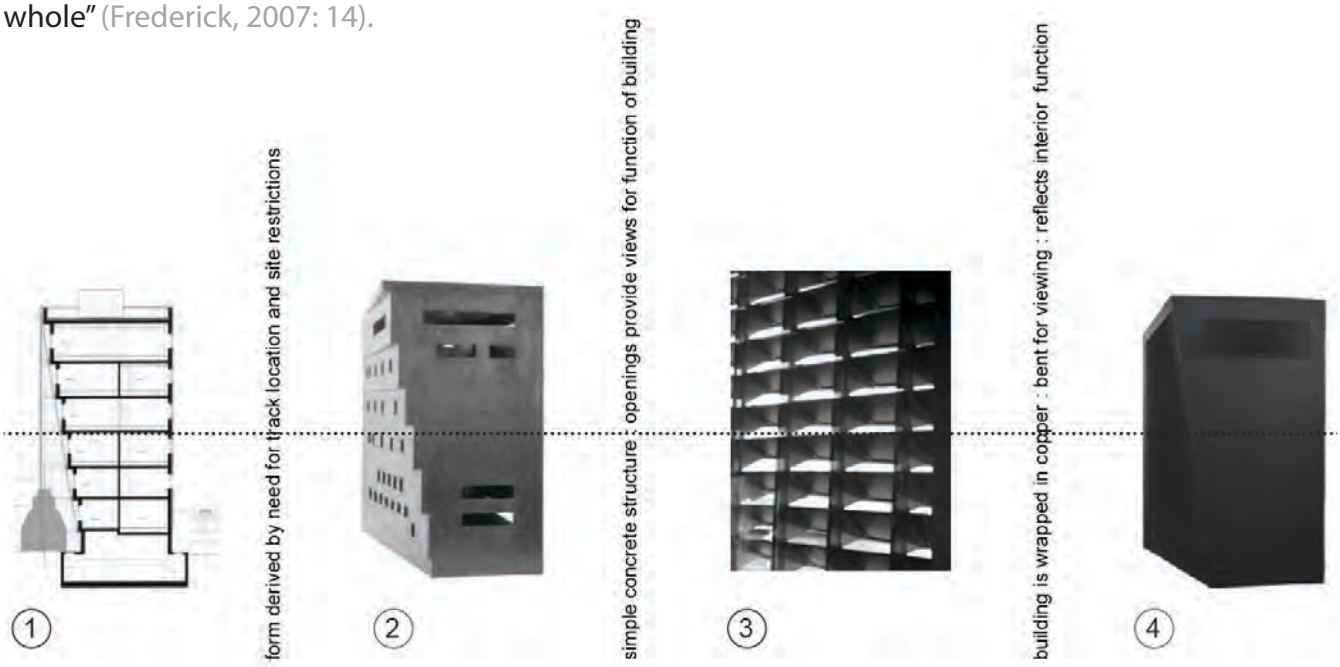


FIG 4.25: THE DESIGN OF THE CENTRAL SWITCH YARD RESPONDS DO BOTH IT'S SURROUNDING CONTEXT AND INNER WORKINGS, EXPRESSING THE DNA OF THE BUILDING. SHAPED BY THE ADJACENT RAILWAY TRACKS, THE STRUCTURE IS WRAPPED WITH COPPER STRIPS, MIMICKING AN ELECTRIC SPOOL - APPROPRIATE SINCE THE BUILDINGS HOUSES PRIMARILY TRANSFORMERS. THE COPPER ALSO ACTS AS A FARADAY CAGE PROTECTING THE SENSITIVE EQUIPMENT WITHIN FROM LIGHTING STRIKES (SCHONHADT, 2005: 17).

Tadao Ando is another architect of the same opinion. One of his theories is 'transparent logic', where he notes that, "architecture is never simply a method of problem-solving, *whereby given conditions are reduced to technical issues. Architectural creation involves contemplating the origins and essence of the project's functional requirements and the subsequent determination of its essential issues. Only in this way can the architect manifest in the architecture the character of its origins, creating a rich and variable architecture.*" (Jencks, 2006: 256).

Through the consideration of the above statements, it is therefore the author's opinion that architecture should not be trapped in any form of style, but rather that each building should reflect a unique response which results from a holistic design process. Where the architectural expression is derived based from the user's activities and surrounding context in addition to becoming a form of artistic expression. By using the performative or functional qualities of a building as a means of deriving its ultimate form and aesthetics, the building will take on additional meaning. This interaction creates a more open ended and lived architecture, not only engaging the user physically, but also metaphysically, through the creation of spaces which allow the user to reinterpret and understand the environment around them. This investigation revolves around using the actions of the building in terms of its relationship to the user's activities and resistance or acceptance of internal and external flows as a means of generating a more meaningful architecture (Fig 4.26) (Schonhadt, 2005: 7-11).

Kolarevic and Schonhadt believe that through abstraction of notions relating to the typology of the built form, this creates ambiguity in which the user's perceptions generate unique meanings for individual interpretations. The interior program can be used to derive the exterior, creating a formal relationship which conveys the function of the building and its place in the city. Through embodying the building with a sense of ambiguity and artistic represen-

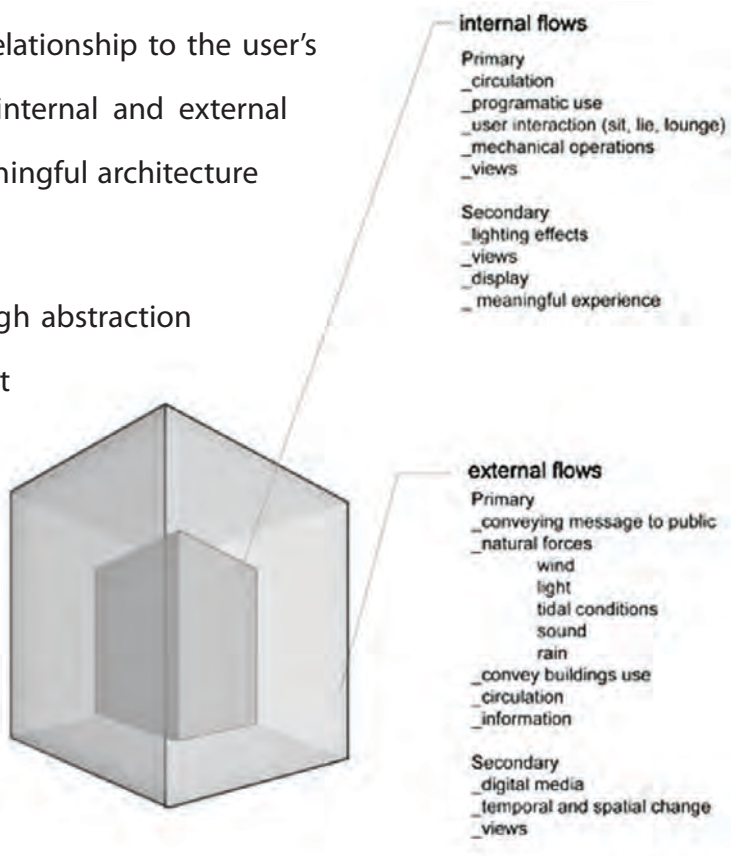


FIG 4.26: FIGURE OF INTERNAL AND EXTERNAL FLOWS (SCHONHADT, 2005: 11).

tation, the goal is to create an architectural expression that expresses the inner forces of the building while relating to the surrounding environment. In other words, the building would become an expression of its internal program, through an evolutionary design process where meaning, beauty and function merge (Fig 4.27) (Kolarevic, 2005: 12 & Schonhadt, 2005: 22).

FIG 4.27: THE RICOLA STORAGE BUILDING (1986-1987), DESIGNED BY HERZOG AND DE MEURON WAS AN EXAMPLE OF HOW ARCHITECTURAL EXPRESSION CAN BECOMES A REFLECTION OF THE USE OF THE BUILDING. IN THIS EXAMPLE THE HORIZONTAL BANDS OF THE FACADE MIMIC THE STACKING OF STORED TIMBER BOARDS. THIS IS A VISUAL REFERENCE TO "THE TRADITIONAL STACKING OF SAWN TIMBER BOARDS AROUND THE NUMEROUS SAW MILLS OF THE AREA, AS WELL AS THE LIME STONE QUARRY WITHIN WHICH THE STORAGE BUILDING SITS." THE MIMETIC POWER OF THIS BUILDING AND OTHERS IS BASED ON THE SPECIFIC SITUATION OF PRODUCTION AND THE CIRCUMSTANCES OF EACH PROJECT RATHER THAN THE IMAGE OF AN EARLIER ARCHITECTURE. FOR HERZOG AND DE MEURON, THE PROCESSES AND PROCEDURES OF PRODUCTION BECOME THE KEY COMPONENTS OF A WORK'S IMAGIBILITY (LEATHERBARROW, 2005: 212).

This chapter centres on identifying an appropriate architectural response of a regional HPC for Durban. Where, the built environment is perceived as an abstract notion of the activities taking place inside, expressing the ethos of its typology. Functionally, a High performance centre is about using advanced technology to optimise performance, health and efficiency within the human body. Therefore similarly, parallels can be drawn in architecture, were the built form can be combined with advanced technology in pursuit of a healthy/ecologically sustainable built environment which functions in an optimal way. The architectural expression will therefore be generated by the 'optimum' interaction with its users and surrounding context.

It is for this reason that new technologies and concepts will be explored in order to create an environmentally sustainable intervention in which the buildings 'performance' between the users and surrounding context becomes a generator for the architecture. This will be done in order to create, a more meaningful architecture which expresses the 'DNA' of the building while relating to the users and surrounding environment.

4.2.1 Healthy Architecture – Healthy Environment

Introduction:

"Athletes relentlessly train. Fresh oxygen powers through their blood. Pure water quenches their thirst. A clean environment provides them with their most precious asset – the opportunity to excel" (Bale, 2004: 104).

From the statement above it can be seen that the users of a HPC require a healthy environment to perform at their best. It would therefore be appropriate to expose the occupants to a healthy environment within the building, thus reducing the risk of sick building syndrome and other problems, allowing them to enhance their sporting abilities. Another important objective would be to maintain and preserve the natural ecological balance in the Kings Park precinct, as it is one of Durban's few remaining green open spaces near the heart of the city. It can therefore be seen that the built form aims to be directly informed by the user's needs and surrounding context.

A HPC strives to function in a healthy manor, using technology to the best of its ability. This section therefore focuses on investigating theories, ideas and technologies which would facilitate in the creation of a healthy environment for the users of the HPC whilst integrating the built form into the chosen site of Kings Park. Architect and theorist, David Gissen defines healthy and environmentally progressive architecture as *"An architecture that uses renewable sources to generate energy; uses passive techniques for ventilation and illumination; incorporates, maintains, and recycles greenery, water, and waste; that advances the use of environmentally conscious construction techniques; and that fosters a liveable and viable urbanism"* (Gissen, 2002: 16, 185).

Due to the HPC's association with health and the ability to communicate at all levels makes it a powerful vehicle to deliver environmental messages to a truly global audience (Colthorpe, 2008: 1).

4.2.1.1 Current Problems in the Built Environment

Before electrical heating, cooling, and illumination – architects used a number of 'passive' techniques (which worked without electrical or mechanical equipment) . Despite these achievements, most architects and engineers became more interested in figuring out how to incorporate air-conditioning into buildings, than in making buildings responsive to their surrounding context. This, 'man made weather' detached architecture from nature, allowing for 'one single building for all nations and climates', independent of place. As air-conditioning became more widely accepted in buildings, a new architectural expression was developed, which reflected a move away from passive strategies. The characteristics of this new architectural language were; tightly sealed; smooth skinned glass and steel boxes without operable windows, ventilators, or external sun shades, short of fresh air and natural light, their internal systems divorced from their surroundings. This problem was exacerbated with the development of low wattage fluorescent lights that did not emit much heat, allowing the floor area of the buildings to be widened to the point where natural daylight was almost entirely replaced by artificial illumination. These spaces often did not allow physical nor visual access to the outdoors (Beelman, 2005: 9 & Gissen, 2002: 12, 117).

These convenient, over-conditioned spaces came at a great cost to the environment and the user's health, resulting in 'Sick Building Syndrome'. This syndrome has been defined as "situations in which building occupants experience acute health and/or comfort effects that appear to be linked to the time spent in a particular building, but w*here no specific illness or cause can be identified. Occupants experience relief of symptoms shortly after leaving the building"*. This syndrome has been linked to a deprivation of natural elements. Studies have shown that continuing to live without daily meaningful contact with nature is damaging to humans both physically and psychologically. These 'sick spaces' become detrimental to the users comfort, productivity and wellbeing as well as increasing stress, anxiety, depression, and irritability. This syndrome has increased at such a rate that it now affects more than 30% of the new and renovated buildings worldwide (Beelman, 2005: 11 & Gissen, 2002: 8, 185).

Buildings have a massive impact on the environment and resources. Currently 40% of global raw materials are consumed by buildings and they produce approximately half the global carbon emissions each year (Fig 4.28). One may think of cars and factories as the most obvious enemies of the environment, but buildings consume more than half the energy used worldwide and contribute

to a massive amount of waste. It is therefore an architect's responsibility to design buildings which do not adversely affect the natural environment and human health, developing a way of living that can sustain the planet and future generations (United Nations, 2005: 10).

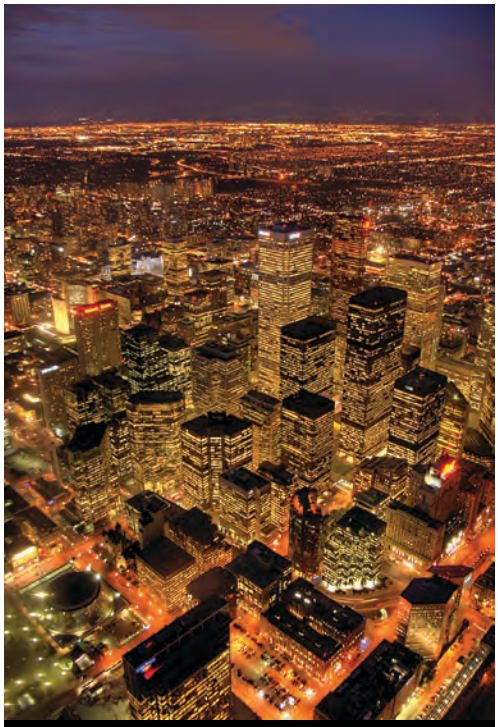


FIG 4.28: TORONTO CITY AT NIGHT (ELIS,2009 :1).

Fortunately architects have become aware of the above problems and are beginning develop design criteria for achieving more environmentally conscious buildings (Fig 4.30). They have started to revive passive techniques (Fig 4.29) and are constantly developing innovative strategies for natural ventilation and illumination as well as advanced techniques for providing natural air-conditioning in buildings of unprecedented size in the hottest of climates. This new generation of building uses renewable energy to drive environmental systems, rather than operating as hermetically sealed, artificial internal climates. By combining natural ventilation systems with new building management technologies, it is possible to design highly efficient buildings with extremely low emissions. These building are not only healthier to their users and environments but also cost less to operate (Gissen, 2002: 41, 47). "*A sustainable building on average costs 2% more to construct; however these green features, over the 20 year life of the building, pay back the investment by over 10 times, by reducing operating/maintenance costs and creating an environment which reduces absenteeism and increases employees motivation and productivity*" (Kats, 2003: 10).

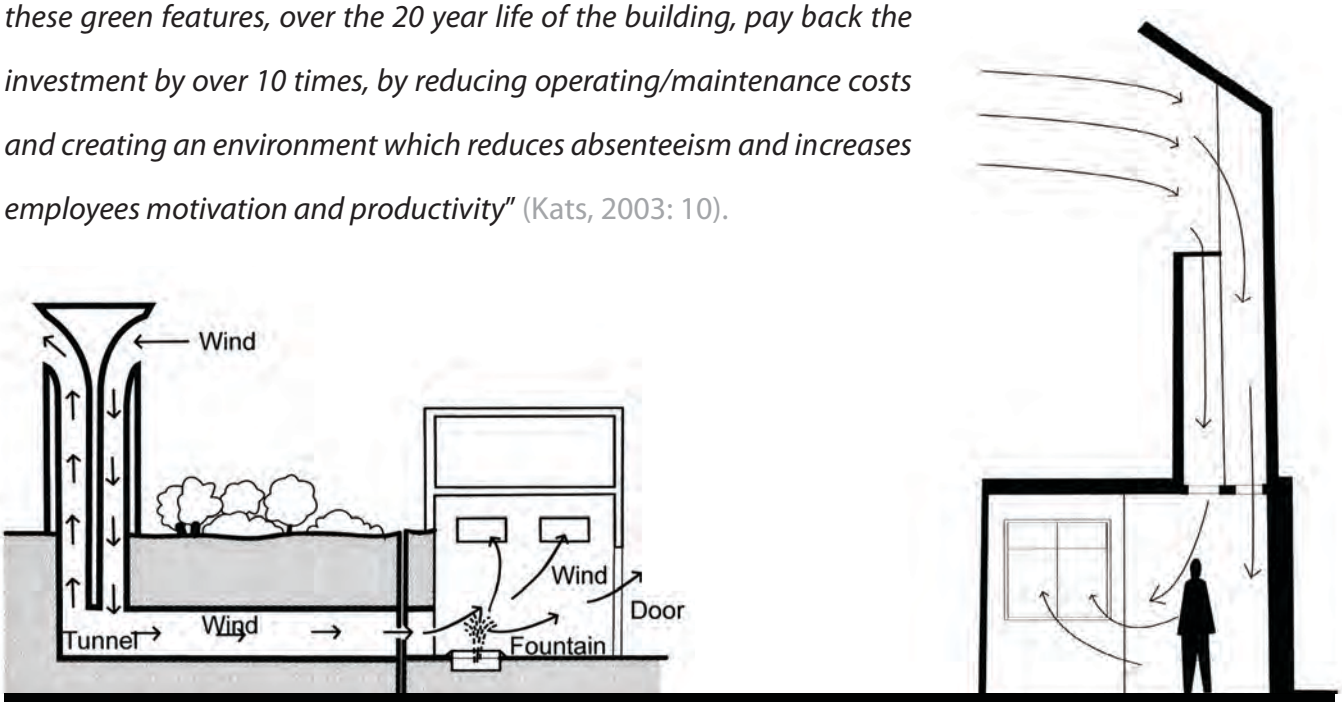


FIG 4.29: A WINDSCOOP IS EXAMPLE OF A REVIVED PASSIVE SYSTEM FOR VENTILATION AND COOLING (YEANG, 2008: 192)

Water-efficiency opportunities

- Reduction in use of water: reduce the flow in sanitary fixtures and HVAC equipment.
- Landscaping water efficiently: reduce the potable water requirements. Capture rainwater and recycle grey water.
- Wastewater innovative technologies: reduce sewerage quantity.

Site opportunities

- Redevelopment of urban sites: redevelop existing urban sites as opposed to developing rural sites, thereby reusing urban infrastructure.
- Redevelopment of brownfield sites: redevelop contaminated sites, thereby reducing development pressure on other sites.
- Site selection: do not develop inappropriate sites, ie those within flood zones, agricultural land or wetlands.
- Site disturbance reduction: restore damaged areas and conserve natural areas; use native vegetation.
- Transportation alternatives: promote alternative transportation methods, ie cycling, light rail and van pooling.
- Management of storm water: do not create a net increase in storm-water runoff or attempt to reduce the runoff; capture rainwater for use.
- Reduction of light pollution: keep outdoor lighting as low as possible.
- Reduce heat islands: use shading elements to reduce urban heat-island effects.

Resources and materials

- Reuse of resources: reuse of materials.
- Reuse of building: reuse of portions or all of a building.

  Recycle content: reuse of the recycle content.
- Management of construction and waste: recycle land clearing, demolition and construction waste; use life-cycle cost analysis in material selection.
- Use local and regional materials: the more local the materials the less money and fewer resources are spent bringing the material to the site.
- Wood certification: use wood from Forest Stewardship Council guidelines.
- Materials that rapidly renew themselves: use agricultural products that rapidly renew themselves, eg bamboo.
- Recycle content: use products high in recycled contents.
- IAO minimum performance: ASHRAE Standard 62-1999 for ventilation.

  Materials with low emissions of VOCs: carefully select adhesives and sealants, paints and coatings, carpets and wood products to reduce VOC of off gassing.

  Day-lighting: day-lighting a building can reduce energy consumption and increase comfort.

  Thermal comfort: the ASHRAE Standard 55-1992; permanent automated control systems are beneficial to human comfort.

  System control: operable window and individual controls can provide a higher degree of comfort.

  Monitoring of carbon dioxide (CO_2): monitoring of carbon dioxide levels is important for indoor air quality.

  Indoor air quallity management plan during construction phase: indoor air contamination reduced by implementing IAO plan during the construction phase.

  Environmental tobacco smoke (ETS): restrict smoking in the building to restricted rooms.

  Control of indoor pollutant sources and chemicals: mats can help maintain lower indoor pollution, isolate areas for working with hazardous chemicals.

FIG 4.30: EXAMPLES OF LEED CRITERIA (LEADERSHIP IN ENERGY AND ENVIRONMENTAL DESIGN) (YEANG, 2008: 97)

4.2.1.2 Architects and Nature

Many successful architects, through the ages, have explored the relationship of the built form and nature. Vitruvius, author of the first known treatise on architecture, 'Ten Books on Architecture', illustrates of a number of issues relating to architecture and nature. He discusses climate, building orientation, the path of the sun, the direction of the wind, proximity to water, and fertility of the soil. He subsequently relates these elements to the health of the human body (Beelman, 2005: 44).

Le Corbusier, incorporated nature into his "Five Points of Architecture." The first point, use of pilotis, elevated the building off the ground which helps improve airflow through the building. The third point, Horizontal bands of windows, brought large amounts of natural light into rooms, and operable windows encouraged natural ventilation. The fifth point, the roof garden, was intended to replace the area of land occupied by the building footprint. These roof gardens often became the most popular space of his buildings (Fig 4.31) (Beelman, 2005: 44).

FIG 4.31: VILLA SAVOYE DEMONSTRATING LE CORBUSIERS 'FIVE POINTS OF ARCHITECTURE' (CUTHBERT, 2009: 1).

Alvar Aalto's work was also characterized the connection between nature and his architecture. The scenic landscapes of Finland were a source of inspiration to Aalto. His architecture focused on daylight, fresh air, and most notably, materiality. Aalto successfully combined advanced technology of the times with the rich materials of nature (Beelman, 2005: 45).

Louis Kahn regularly designed his buildings as if it were "a conversation between man and nature," integrating water, light, and natural materials into the architecture (Beelman, 2005: 45).

Jean Nouvel notes that, "The sun, the wind, heat and cold – it should be part of the str*ategy for defining a building. Architects not only need to be kind to nature – they can learn lessons from it and imitate it.*" (Callaghan, 2008: 4).

Frank Lloyd Wright sought to design buildings with a strong affiliation to nature. Wright felt that the "concept of the building would emerge naturally out of the site."(Fig 4.32). If natural beauty was not a part of the site itself, he would take special care in attaining it through his architecture and landscape design, by infusing the spaces with daylight, trees and natural materials indigenous to the area. This integration of nature and architecture was something Wright felt very strongly about, in terms of materiality, function and aesthetics (Beelman, 2005: 46).

FIG 4.32: FALLING WATER BY FRANK BECOMES AN EXTENSION OF THE LANDSCAPE (FIGUURA, 2007: 1).

Architects such as Alexander Pike, Richard Rogers, and Norman Foster strove to design an architecture which integrated both nature and advanced technology. There architecture incorporated ideas from; early, passive buildings, Buckminster Fuller *(Prefabrication and technological imagery)*, the emerging aerospace industry *(solar cells, wind turbines, and mirrored glass)* and nature. The result of this was a prefabricated architecture which was luminous, well ventilated and highly energy efficient. According to critics, one of the major accomplishments of the high tech movement was that it showed that energy-efficient, environmentally sensitive architecture could be improved if advanced technology was combined with passive techniques and nature (Gissen, 2002: 13).

4.2.1.3 Integrating Nature

As cultural values change and an increasing number of people live in urban areas, people find themselves leading lives that are separate from nature, which has become detrimental to mans' well-being, psyche and physical fitness. The rise of urban sport became a way of escaping this industrialised landscape, returning to the healthy, organic values of nature. However the majority of sport is now undertaken in industrialised, synthetic facilities, rather than in facilities which embrace the natural environments. People become acclimatised to taking part in these artificial settings, which further distanced them from nature (Bale, 2004: 108 & Houlihan, 2003: 272).

Research proves that regular contact with nature offers an abundance of physical and psychological benefits, and it can be argued that this relationship is crucial to an individual's health and happiness. While the ideal relationship with nature would be closer to the way native cultures often live, the fact cannot be denied that today's society is technologically advanced with high standards of comfort and convenience. Nor can it be ignored that much of the global population chooses to live and work in cities. Architects and planners must find a solution that accepts society's urban lifestyle while integrating methods of meaningful contact with nature. Throughout this section it will be seen that nature and buildings are not mutually exclusive, that they can exist in harmony rather than conflict (Beelman, 2005: 10, 49).

It is therefore in the author's opinion that it would be beneficial to synthesis the built form of the HPC with nature in order to create a healthy environment which allows the users to perform at their best. For the purposes of this argument, a connection to nature can be defined as daily contact with natural elements – such as daylight, vegetation, fresh air, views to nature, and people - that will encourage physical and mental health (Beelman, 2005: 10).

Daylighting: Architects should strive to provide daylighting to every space of the building, when possible. The building's configuration, massing and orientation, is critical to maximizing daylight opportunities. The aim is to optimize daylight and bring natural light as deep into the building as possible. Artificial lighting or Electrical lighting should be supplemental and remain secondary to daylight. Although natural light is preferred, it is essential that it is appropriately controlled at various times of the day and year to avoid glare, streaks, and excessive heating. The appropriate solar control or shading device is determined by the location, orientation and massing of the built form (Fig 4.33) & (Fig 4.33) (Beelman, 2005: 52).

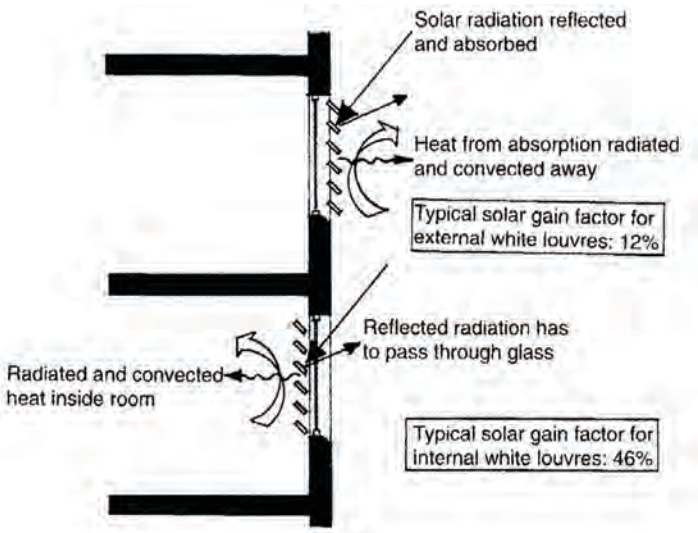
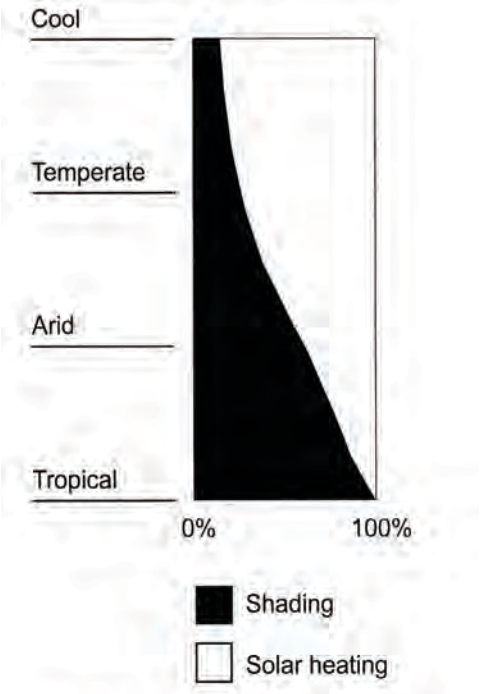


FIG 4.33: COMPARISON BETWEEN INTERNAL AND EXTERNAL SOLAR SHADING DEVICES (YEANG, 2008: 204)

Research by Seattle City Light lists the advantages of daylighting:

- Visual pleasantness
- Connection to nature
- Reduction in Sick Building Syndrome
- Time and weather information
- Spectral Quality ("full spectrum" lighting; with higher colour temperature and increased visual clarity at lower light levels)

Daylighting in education spaces has been proven to generate enhanced learning environments and retail stores with natural light have reported higher sales figures. Daylighting also has the added advantage of energy efficiency and cost savings (Beelman, 2005: 52).



Beginning at the equator and moving north, the need for solar heating increases (white range), while the need for solar shading (black range) follows the opposite course.

FIG 4.34: ANNUAL PERCENT OF REQUIRED SHADING & SOLAR HEATING (YEANG, 2008: 201)

Green Space: Green space, both interior and exterior, are essential to an architecture that promotes a connection with nature. Buildings should provide areas rich in vegetation, utilizing a diversity of plant life. These spaces soften the built environment creating more inviting and relaxed spaces while reducing the risk of sick building syndrome (Beelman, 2005: 53 & Gallagher, 1999: 81).

Indoor green spaces should have operable windows or skylights to allow fresh air into the space. Exterior green spaces can include rooftop gardens, courtyards, regular gardens, terraces and balconies. Green roofs have the added advantage of sound and heat insulation as well as storm water retention (Beelman, 2005: 54).

Natural Ventilation: The built form should be optimised in such a way as to promote natural ventilation (Fig 4.35). Buildings should provide spaces that allow access to the outside while also incorporating operable windows to facilitate natural ventilation. Operable windows should be positioned to produce the appropriate amount of airflow (Beelman, 2005: 54).

Natural ventilation has been proven to prevent Sick Building Syndrome, a problem that arises from the gasses given off by toxic building materials which are continuously cycled through the tightly sealed spaces. Natural ventilation allows fresh air exchange, preventing a build up of toxic gasses and the circulation of airborne germs (Beelman, 2005: 54 & Gissen, 2002: 8, 185).

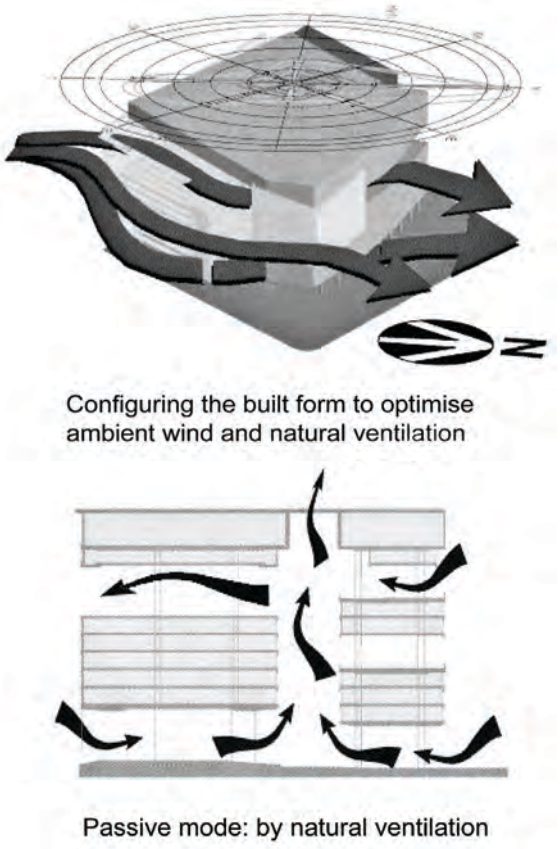


FIG 4.35: OPTIMISE THE BUILT FORM FOR NATURAL VENTILATION (YEANG, 2008: 200)

Views: Whenever possible, rooms should take advantage of views to the natural environment. Views of nature can be relaxing or stimulating, they can inspire awe or contemplation. Views allow occupants to notice changes in weather patterns, time of day, and the seasons (Beelman, 2005: 54).

Studies have shown that even video footage and photos of natural landscapes can have similar effects to that of actual views of nature. However, simulated views should remain secondary to nature itself (Beelman, 2005: 54).

Other Methods: There are a variety of other methods that can be employed throughout the built form to encourage a connection with nature. Most notably is the use of water in architecture. Studies have shown that people prefer landscapes and building which embrace the use of water. The sound of flowing water can often be very calming, covering up unwanted background noise. Reflective pools can add dimension to a space and active fountains can add life (Beelman, 2005: 55).

Water can also be used to treat air in buildings. Introducing water features in and around buildings not only increase ones sense of well-being and harmony, but can clean the air itself. When air passes over water, its humidity arises, and microscopic droplets cling to dust particles carried in the air. Their weight increases and they become too heavy for the air to carry – thus the air becomes cleaner. In hot climates, water can cool air as it evaporates. By directing air through the path of evaporating water, the air temperature is reduced significantly at the cost of a slight rise in humility. This technique can be used to cool air in an atrium and circulation spaces, where temperature is more important to comfort than lowering humidity (Gissen, 2002: 89).

Community: Just as it is important to connect with other living organisms such as plants and animals, people must not forget the importance of contact with other human beings. In an age of email and working from home, architects must create opportunities for people to communicate with each other in a personal, face-to-face manner. While places for solitude and contemplation are necessary, architects must also provide spaces in which various numbers of people can socialize with one another. The design of spaces should accommodate pairs of people, small groups, and larger groups. There should be spaces for people to work together and play together. An example of this type of space may be community rooms available for users to gather and relax. These spaces should remain flexible for a variety of activities such as group study sessions, movie screenings, student meetings or other social gathering (Beelman, 2005: 55).

4.2.1.4 Learning from Nature

"*Every new building deprives a plot of earth of the healing forces of the sun, wind, rain and animal life. The building must redeem this by its own qualities.*" (Kenneth Bayes, Living Architecture, 1994).

The earth's natural communities are extraordinarily effective in making food from the sun, producing oxygen, filtering water and recycling nutrients and energy. They succeed, not by reproducing the same response worldwide but by fittingly elegantly into their surrounding environment. Even nature's laws express themselves variously in different communities, as processes such as photosynthesis and nutrient cycling yield different forms from region to region. Architects are beginning to question the design of buildings as sculpture, as objects separate from nature, and as a result they have started looking toward the natural world for answers. Perhaps, instead of only following the law of gravity, architects could follow other natural laws that govern life: one organisms waste equals food for another; living things thrive on the energy of the sun; and natural systems celebrate diversity. By using these 'natural laws' architects are finding innovative ways to design buildings which bring us closer to the goal of true environmental sustainability (Ford, 1999: 11 & Gissen, 2002: 6, 8).

According to David Gissen, many conventional architectural practitioners find it easier to design buildings as if nature and place did not exist. An ecologically aware architect would be immersed in the life of each place, tapping into natural and cultural history, investigating local energy sources, vernacular architecture, the availability of sunlight, shade and water, and the biodiversity of local plants and animals of the region. The intention of the architect would be to design a building that creates aesthetic, economic, social, and ecological values for the surrounding human and natural communities. This would represent an entirely new approach to following nature's laws (Gissen, 2002: 8).

This concept is similar to the theoretical construct of Critical Regionalism. Kenneth Frampton roughly defined, critical regionalism as the pursuit to merge the unique features of a region, including physical and cultural characteristics, with appropriate current technology. Ultimately, it is the search for an architecture that is meaningful within its micro-context, while concurrently participating in the more universal aspects of a contemporary, mobile society (Jencks, 2006: 98).

A new generation of 'bioclimatic designers', have begun to address architecture's potential of achieving true environmental sustainability. One of the leading practitioners of this field of architecture, Dr

Kenneth Yeang, has developed an intricate architectural language for expressing his philosophy (Gissen, 2002: 44).

Yeang starts by looking at nature. His current work is based on biomimesis (designing or learning by imitating nature) and ecomimesis (designing using analogies of ecosystems and ecology), working towards designing buildings which function as urban ecosystems. Ecologists see ecosystems in terms of flows, and Yeang is trying to look at architecture in the same way. For instance, ecosystems have no waste; everything is recycled. By this imitation, the built environment could reduce or eliminate waste by continuously reusing and recycling all emissions and by-products. This radical shift in attitude would change a cities linear metabolism to a circular metabolism (Fig 4.36) – Cities able to effectively treat waste products and generate energy as well as consume it. In order to achieve this goal of a sustainable urban ecosystem; architects, designers, and engineers need to embrace a combination of new technology and unique spatial qualities of the site (Gissen, 2002: 37, 175, 177 & Yeang, 2005: 1).

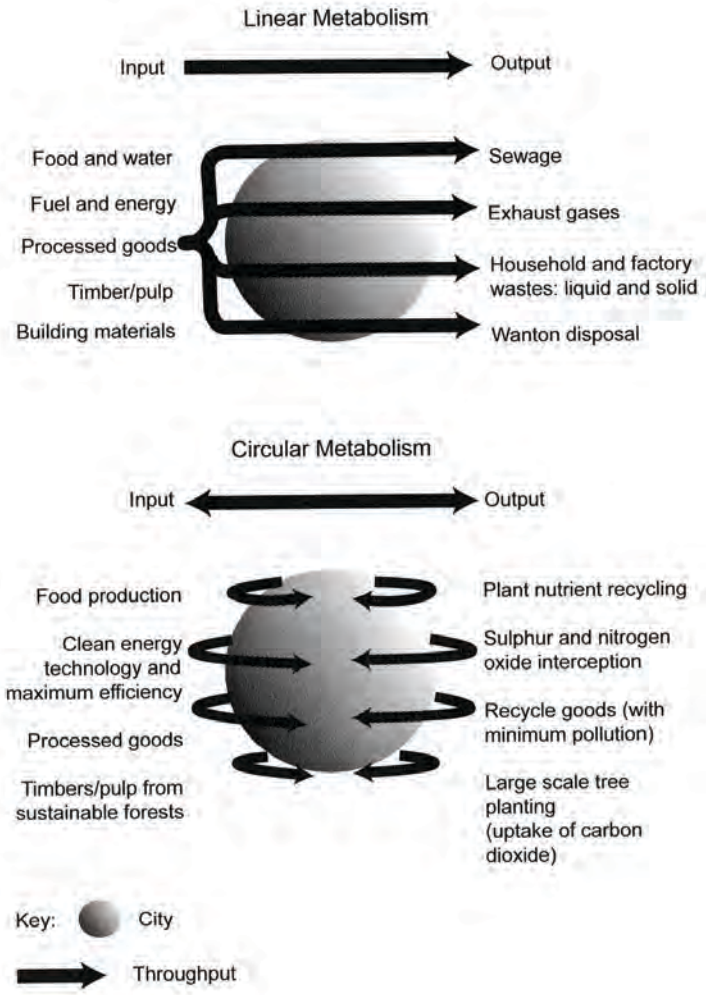


FIG 4.36: CONSUMPTION MODELS OF CITY METABOLISMS (YEANG, 2008: 315)

The material composition of the built environment is almost entirely inorganic, whereas ecosystems contain a complement of both inorganic and organic constituents. Yeang's view is that architects must reverse this trend by balancing the built environment with greater levels of biomass, rectifying biodiversity and ecological connectivity in the built forms and complementing their inorganic content (Fig 4.37) (Yeang, 2005: 2, 3).

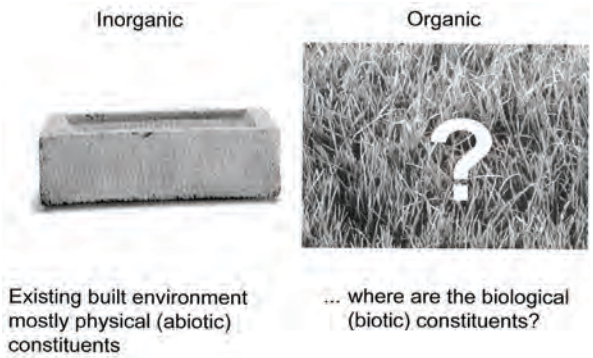


FIG 4.37: DESIGN MUST BALANCE THE INORGANIC AND ORGANIC CONTENT (YEANG, 2008: 133)

One of his objectives is to maintain the continuity of the built environment and surrounding landscape by improving the ecological linkages, both horizontally and vertically (Fig 4.38) & (Fig 4.39). Achieving these linkages ensures a wider level of species connectivity, interaction, mobility and sharing of resources across boundaries. The enhanced biodiversity further increases habitat and species survival. He also uses this strategy at an urban scale, introducing ecological corridors which link all the green areas of the city together, thereby generating a more biologically viable urban fabric (Gissen, 2002: 175 & Yeang, 2005: 3).

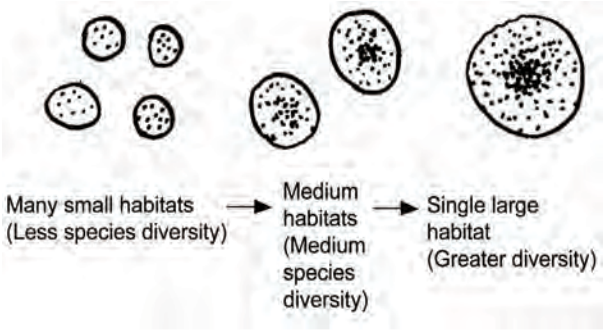


FIG 4.38: DESIGN TO INCREASE BIODIVERSITY BY LINKING VEGETATED AREAS (YEANG, 2008: 152)

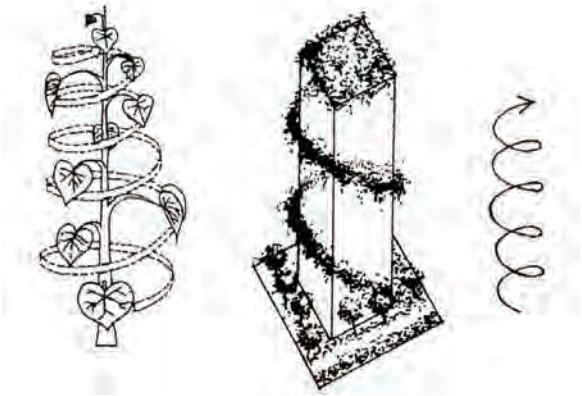


FIG 4.39: CONTINUOUS VERTICAL LANDSCAPING (YEANG, 2008: 143)

More than enhancing ecological linkages, architects must biologically integrate the inorganic aspects and processes of the built environment with the landscape so that *"human-made ecosystems"* are created which are compatible with the ecosystems in nature (Fig 4.40) (Yeang, 2005: 3).

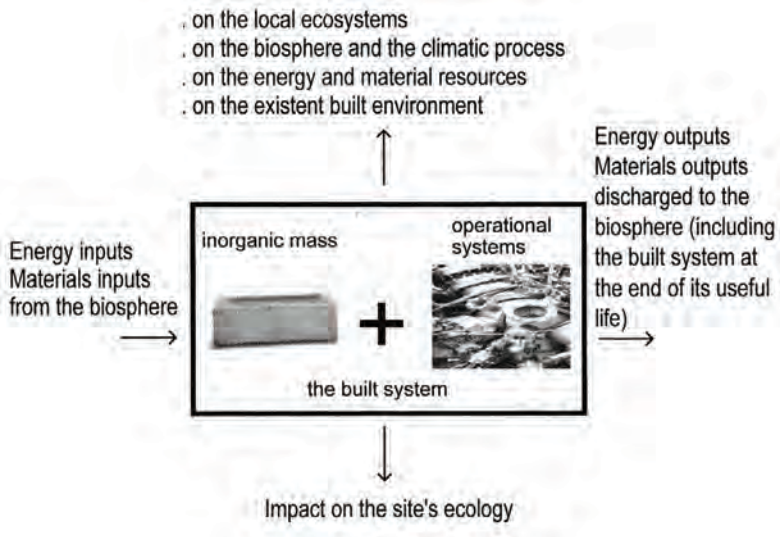


FIG 4.40: INTEGRATING THE BUILT ENVIRONMENT'S IMPACTS WITH THE NATURAL ENVIRONMENT (YEANG, 2008: 23)

4.2.1.5 Architecture as a Prosthetic to the Environment

Yeang suggests that ecodesign can also learn from the problems and solutions of integration encountered in prosthetics design. Prosthetics seek effective biointegration of the artificial organ with its host human (Fig 4.41). The design of the built environment similarly seeks effective biointegration of the artificial human-made designed system (built environment) with its host organism (natural environment). A comparison can be made between ecodesign and prosthetic design as both share the common problem of the biointegration of the human-made artificial system with its host organic system. This analogy is relevant for architects seeking solutions to the problems of the integration of the built environment with the natural environment as a successful ecodesign is dependent upon the effectiveness of this assimilation (Yeang, 2008: 427).

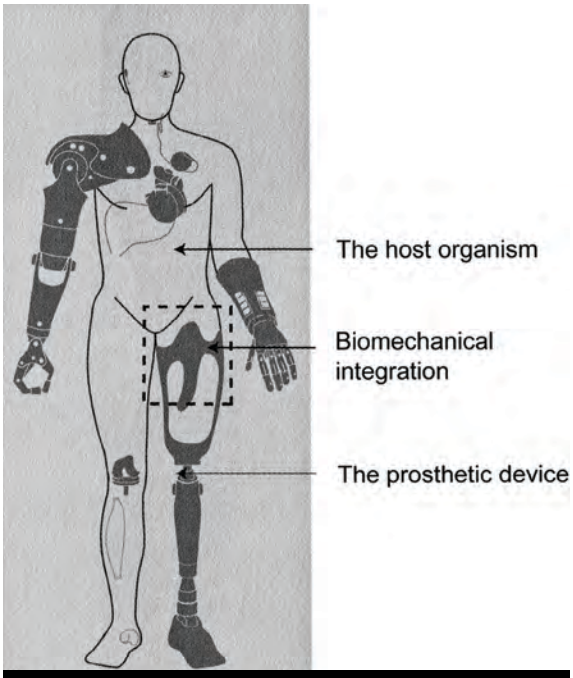


FIG 4.41: ECOLOGICAL DESIGN AS ANALOGOUS TO PROSTHETICS DESIGN (YEANG, 2008: 143)

In applying this analogy, one must be aware that unlike machines and mechanical systems, organisms have a holistic property where the whole is greater than the sum of its parts. By analogy, the built environment must not only be designed for mechanical integration, it must be holistically integrated with the ecological and human systems, their functions, processes and flows. The built environment must not be designed as just mechanical additions to the natural environment (Yeang, 2008: 427, 433).

Much can be learned by looking at prosthetic integration into the human body. There are two primary methods of such integration, which can similarly be applied to ecodesign: the additive-mechanical and the integrated system. By analogy these are possible ways in which the built environment can be integrated with the natural environment. For instance in the case of the human ear, an example of an additive-mechanical device is the normal hearing aid. A higher level of prosthetic integration would be cochlea implant (an integrated system). These implants allow people who would otherwise be deaf, to hear well enough to understand speech better than they would if using a regular hearing aid, which only amplifies sound. The electrodes of these artificial cochleae are permanently implanted, so

there is a direct connection between electronics and the nervous system of the patient. By analogy in ecodesign, the equivalents to the implants can be installed into the built form by way of a network of linked environmental biosensors and activators which monitor and react to the systemic interactions between the built environment, the users and the processes in the surrounding ecosystem (Yeang, 2008: 430).

This is what David Leatherbarrow terms 'unscripted' performance. This is an interaction which allows for the environment and user to control and alter the appearance and performance of the building depending upon their use and interaction with the building. Thus, the appearance of the building will be constantly changing depending upon these variable conditions. These conditions can range from environmental forces to the users interactions. In its simplest form, this interaction can be seen in a buildings penetrations and shading devices which alter the relationship of interior and exterior. In this scenario, the architectural 'body' is the result of a complex interaction between program and user, and user and the environment. This type of dynamic interaction will facilitate a more open ended architecture in which the unpredictability of nature and ever changing needs of the users alter the perception of the building (Schonhadt, 2005: 20).

Ecological design is essentially about designing the built environment as artificial systems integral mechanically and systematically with the ecosystems in nature in a way that is favourable to the natural environment and enables both the artificial prosthetic system and the natural host system to function successfully. The future of ecodesign may lie in applying some of the principles of prosthetic design and identify how effective biointegration can benefit both the design of the built environment and the surrounding context (Yeang, 2005: 6 & Yeang, 2008: 429, 344).

4.2.1.6 Modes of Achieving Efficient Ecodesign

Yeang emphasises that architects must look into ways of configuring the built forms and operational systems of the built environment as low-energy systems whilst improving internal health and comfort conditions. He notes that there are essentially five modes of achieving this: Passive Mode (or bioclimatic design), Mixed Mode, Full Mode, Productive Mode and Composite Mode (Yeang, 2005: 4).

Yeang's design method is to first optimize all Passive Mode (bioclimatic) strategies before proceeding to the other modes. Passive Mode is designing for improved comfort conditions over external conditions without the use of any electro-mechanical systems (Fig 4.42). Examples of Passive Mode strategies include adopting appropriate building massing, form and orientation in relation to the locality's climate. It also involves appropriate façade design (e.g. solid-to-glazed area ratio, suitable thermal insulation levels, use of natural light and ventilation, use of vegetation, etc.). This mode can

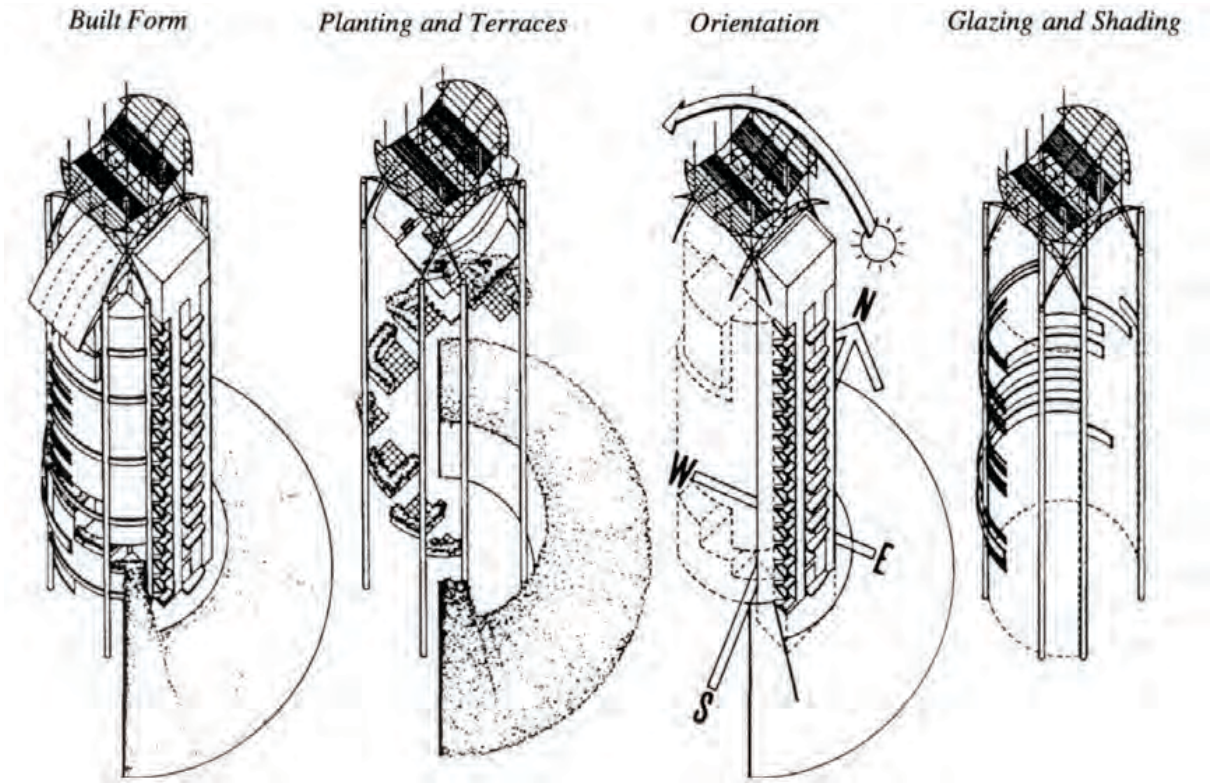


FIG 4.42: EXAMPLE OF PASSIVE MODES USED IN THE MENARA MESINIAGA, MALAYSIA, DESIGNED BY KEN YEANG (SAFAMANESH, 1995: 9)

significantly influence the orientation and configuration of the architecture and its form. Therefore, this must be the first level of consideration in the design process; following this other modes to further enhance the energy efficiency can be adopted. Passive Mode requires an understanding of the climatic conditions of the locality, to synchronize the built form with the surrounding atmospheric

conditions and optimize the ambient energy of the locality into a building design with improved internal health and comfort conditions. If a particular mode is adopted without previously optimizing the Passive Mode options in the built form, non-energy-efficient design decisions will have to be corrected with Full Mode systems, which tend to be energy intensive systems. Furthermore if the built form optimizes its Passive Modes, it will remain at an improved level of comfort during any electrical power failure; preventing the building becoming intolerable to occupy when there is no external energy source (Gissen, 2002: 177 & Yeang, 2005: 4, 5).

Meeting contemporary expectations for comfort conditions in many climates cannot be achieved by Passive Mode alone. The internal environment often needs to be supplemented by some electro-mechanical systems, as in Mixed Mode. Examples including ceiling fans, double facades, flue atriums, evaporative cooling etc. These systems often use external energy sources; whether from fossil-fuel sources or from local ambient sources (Yeang, 2005: 4 - 5).

Full Mode is the full use of electro-mechanical systems, as in many conventional buildings. If users insist on having consistent comfort conditions throughout the year, the designed system heads towards a Full Mode design (Yeang, 2005: 5).

Productive Mode is where the built system generates its own energy (e.g. solar energy using photovoltaic's, or wind energy) Buildings must minimize the use of non-renewable sources of energy. In this regard, low-energy design is an important objective (Yeang, 2005: 5).

Composite Mode is a composite of all the above modes and is a system that varies over the seasons of the year (Fig 4.43) (Yeang, 2005: 5).

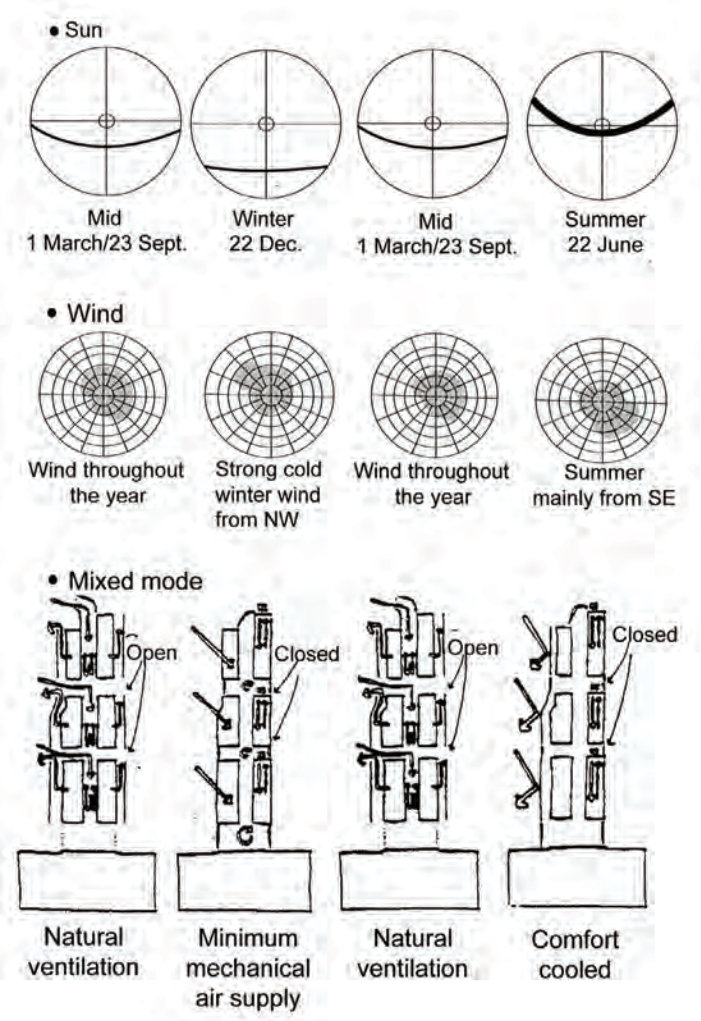


FIG 4.43: COMPOSITE MODE - VARIABLE ADJUSTMENTS OVER THE SEASONS OF THE YEAR (YEANG, 2008: 251)

Ken Yeang's theories suggest a radical shift from designing buildings as inanimate; one size fits all objects, to designing buildings as life support systems embedded in the natural forces of particular places. Ultimately, that is what guides ecologically intelligent design – openness and attention to place that allow architects to discover fitting materials, fitting forms, and fitting systems, so that architecture encourages a healthy relationship with the natural environment. This type of approach generates site specific solutions, if relocated, the architecture will not only be illogical, it will be unsuccessful, as it would not achieve its maximum performance (Gissen, 2002: 122, 124).

Conclusion:

The theories and ideas of this section will be drawn upon in support of a meaningful architectural response for a HPC in the Kings Park Precinct. These theories will inform the design in order to create a healthy environment for the users of the HPC whilst integrating the built form into the chosen site of Kings Park.

The health of the buildings users was seen as an essential objective to the design. By exposing the occupants to a healthy built environment, it will reduce the risk of sick building syndrome and other problems, allowing them to enhance their sporting abilities.

Another important objective to the design was to maintain and preserve the natural ecological balance in the Kings Park precinct, as it is one of Durban's few remaining green open spaces near the heart of the city. By creating an architecture which is responsive and fitting to its unique environment, it would replace the built forms dominance over nature with a more fulfilling relationship with the natural.

Ultimately, it can be seen that the architecture aims to be directly informed by the user's needs and surrounding context.

4.3 CHAPTER 4 SUMMARY

This chapter was divided into two sections, Urban Theories and Architectural Theories.

Urban Theories

The 'Urban Theories' responded to the positive and negative aspects of the precinct which were identified in the literature review; this is done in order to resolve the identified problems and enhance the positive elements of the surroundings - creating a successful public realm.

- Firstly the theories of Roger Trancik and Kevin Lynch were investigated to reintegrate the 'Lost Space' of Kings Park Precinct with its surrounding context.
- Secondly, the theories of compact cities and mixed use developments were examined to create a safe, well used environment which is vibrant at all times.
- Thirdly, Jan Gehl's theories of life between buildings were analysed to create a successful public realm.
- The fourth section briefly examined the theories of catalytic developments, as a High Performance Centre (HPC) is seen as one of the three major catalytic projects for the precinct. This established the important role of these development types.
- Lastly the theory of 'cultural mobility' was explored to encourage social interaction between the diverse local population. This guided the research to the relatively new urban typology of 'Fan Parks'. These spaces will create common ground within society, allowing opportunities for interaction between people of different cultures and lifestyles, allowing a change of perspective.

These theories will facilitate in the creation of a successful public domain within the sports orientated precinct of Kings Park, which will provide the necessary framework for the proposed HPC to be integrated.

Architectural Theories

Architect and author, David Leatherbarrow notes that the current tendency in architecture is to separate identity and function, which has divided the interaction between the building, the user, and the environment. Architect, Tadao Ando believes that, "*architecture is never simply a method of*

problem-solving, whereby given conditions are reduced to technical issues. Architectural creation involves contemplating the origins and essence of the project's functional requirements and the subsequent determination of its essential issues. Only in this way can the architect manifest in the architecture the character of its origins, creating a rich and variable architecture." (Jencks, 2006: 256).

The first part of the Architectural theories therefore focused on identifying an appropriate and meaningful architecture, which is responsive to its users and surrounding environment, whilst expressing the ethos of the buildings typology. The HPC was perceived as an abstract notion of the activities taking place inside, in order to express the ethos of its typology. Functionally, a High performance centre is about using advanced technology to optimise performance, health and efficiency within the human body. Therefore similarly, parallels were drawn in architecture, where the built form is combined with advanced technology in pursuit of a healthy/ecologically sustainable built environment which functions in an optimal way. The architectural expression will therefore aim to create an environmentally sustainable intervention in which the buildings 'performance' between user and surrounding context becomes a generator for the architecture.

It was seen that the users of a HPC require a healthy environment to perform at their best. It was therefore seen to be appropriate to expose the occupants to a healthy environment within the building, thus reducing the risk of sick building syndrome and other problems, allowing them to enhance their sporting abilities. Another important objective was to maintain and preserve the natural ecological balance and beauty of the Kings Park precinct, by creating an architecture which is responsive and integrated into the chosen sites conditions.

The urban and architectural theories investigated throughout this chapter developed indicators as to relevant precedent studies. The identified precedents will illustrate many of these theories and ideas in the next chapter.

5 PRECEDENT STUDIES

This chapter will critically analyse internationally published examples of projects which demonstrate theories and ideas discussed in the previous chapter. This will reveal issues or design concepts, relevant to the proposed scheme. A list of issues has been drawn up to glean important and useful information which will affect the design of a brief for the proposed High Performance Centre for the Kings Park precinct. These include:

URBAN REVITALISATION STRATEGIES

CATALYTIC PROJECTS

APPROPRIATE ENVIRONMENTAL TECHNOLOGIES AND STRATEGIES

SPATIAL REQUIREMENTS AND RELATIONSHIPS

ARCHITECTURAL EXPRESSION

FLEXIBILITY

The following precedent examples have been chosen to expound on the identified issues:

- **5.1 Sports Event as a Generator for Urban revitalization.**
    - 5.1.1 London 2012 Olympic Masterplans
- **5.2 Catalyst for Urban Revitalisation, Site selection, Spatial Relationships and Flexibility.**
    - 5.2.1 Iceland Sports Academy:
- **5.3 Architecture as an Extension to the Natural Environment.**
    - 5.3.1 The Robert L. Preger Intelligent Workplace
- **5.4 Appropriate Environmental Technologies and Strategies for the Building Typology and Context.**
    - 5.4.1 Utilizing Human Energy
    - 5.4.2 The Integration of Plant Life in Architecture
    - 5.4.3 Architecture as Media Technology
    - 5.4.4 Other Relevant Technologies
- **5.5 Extension of the Natural Environment, Social Integration and Spatial Relationships.**
    - 5.5.1 Mercator Sports Plaza

The analysis will be used to glean information to inform a brief and ultimately the design of a Regional High Performance Facility for Durban. The studies will focus on primary topics of interest; however they will also include overlapping secondary issues which are relevant to the research.

5.1 SPORTS EVENT AS A GENERATOR FOR URBAN REVITALIZATION.

5.1.1 LONDON 2012 OLYMPIC MASTERPLANS

Introduction: In the past many sports precincts have been unsuccessful as they have not considered life after a major sporting event. This creates costly 'white elephants' and a precinct devoid of life. It is important that the precinct benefits the people of the region on a daily basis, long after an event has ended. An investigation of the 2012 London Olympic masterplans will be done in order to; determine how a sports event can be used to revitalise an area of 'lost space'. The analysis will reveal principles of generating a well used sustainable development for the local population, which meets the triple-bottom line of economic efficiency, environmental integrity and social equity.

Economic sustainability: impacts around the creation and distribution of wealth including issues around corporate involvement, the cost of living, business creation and jobs;
Social sustainability: impacts around wellbeing and quality of life including regeneration, volunteering, community cohesion, crime and race relations;
Environmental sustainability: impacts around the carbon footprint of the Games including issues around sustainable public behaviours (EdComs, 2007: 11).

In August 2003 a group led by EDAW was selected by the London Development Agency to prepare visionary regeneration masterplans for the 215 hectare brownfield site of the Lower Lea Valley, located in East London. The project will become one of the largest urban regeneration projects in Europe and will be primarily driven by legacy; hence, the masterplan was seen as two proposals. One proposal focused on the great Olympic and Paralympic Games (Fig 5.1) & (Fig 5.3) and the other focused toward using the Games to generate a positive legacy by uplifting a derelict area of the city (Fig 5.2). The latter, being more important than the Games' short-term use (Moor, 2006: 154 & Salman, 2006: 35).

London won the bid to host the Games in June 2005, highlighting how the Games would boost housing, jobs and sports facilities in the deprived Lower Lea Valley. The designers focused on transforming one of the poorest parts of the UK, characterised by; derelict industrial land, degraded housing and high levels of unemployment, into a sustainable development, capable of staging the greatest sporting show on earth (Puckett, 2006: 23 & Salman, 2006: 35).

FIG 5.1: OLYMPIC MASTERPLAN - THE DESIGN BLUEPRINT OF LONDON'S BID TO HOST THE GAMES (MOOR, 2006: 157)

FIG 5.2: LEGACY MASTERPLAN - VISIONARY REGENERATION MASTERPLAN FOR THE SITE AFTER THE GAMES (MOOR, 2006: 157)

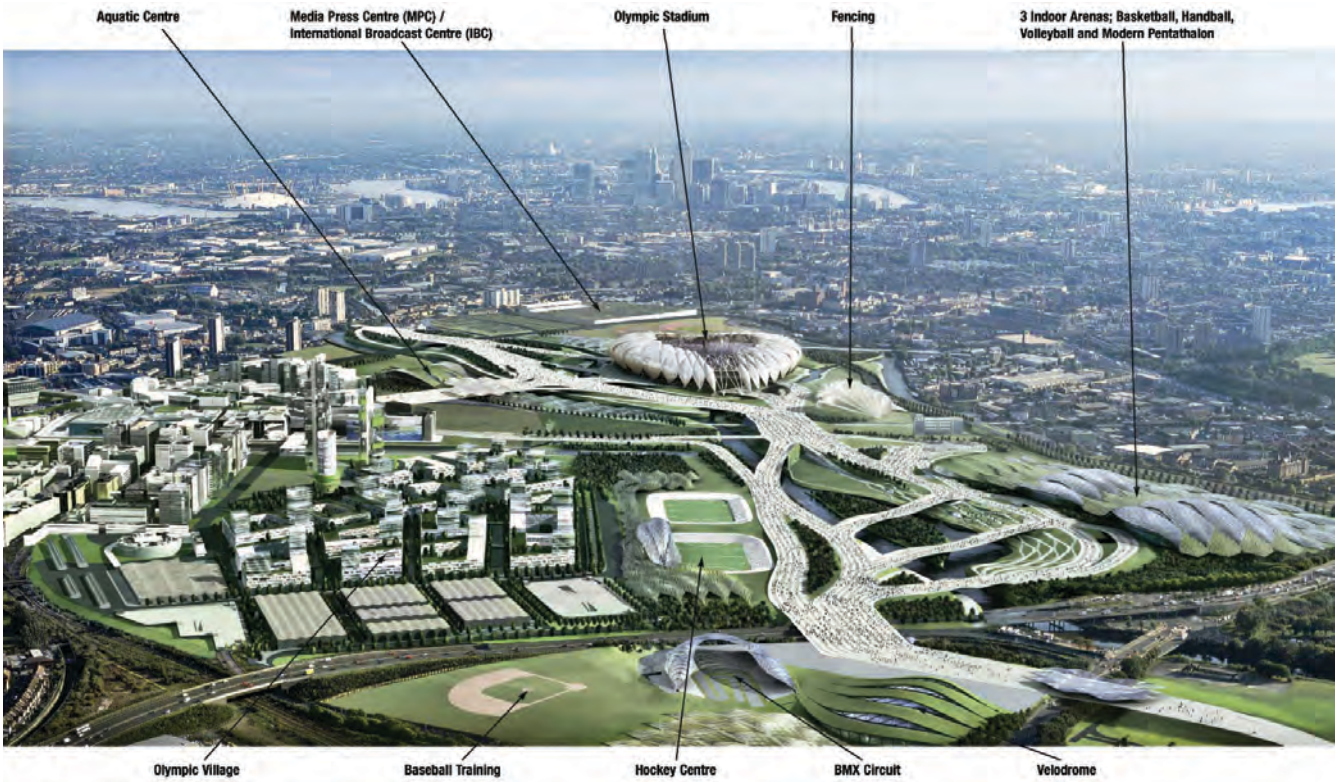


FIG 5.3: OLYMPIC MASTERPLAN (LONDON DEVELOPMENT AGENCY, 2008: 1).

The proposals set new standards of urban design in the UK. They establish a series of layers or issues, each of which act as an individual component but which also create a cohesive total design. These layers include:

A focus on communities: This layer is focused toward creating a socially sustainable and meaningful legacy for London 2012. It was determined that this will be achieved by closely aligning Games' projects with the needs of local communities (EdComs, 2007: 19).

One problem with the urban regeneration of the area is that many residents and businesses have needed to relocated, which has translated into hostility within people of the region (Puckett, 2006: 38 & Salman, 2006: 39). An urban development project of this type in the Kings park precinct would have the advantage of displacing little to none of the existing population, as the area has not yet developed to its true potential.

The plans were built on aspirations within the communities and involved one of the largest public consultation events ever undertaken in London. The aspirations of existing communities and the anticipation of those of incoming communities was a primary concern for the proposals. Therefore great emphasis has been placed on easing the relationships between the two groups by creating inclusive public spaces. These include carefully articulated streets and squares, green space in the parks and 'blue' space through remediation of rivers and canals. It is London's vision to use the power of the Games to inspire change. By using the Games to achieve a significant sporting and cultural legacy, which would act as a catalyst for inspiring people across the country to take up sport and develop active, healthy and sustainable lifestyles. The evidence suggests the feel good factor and shared goals arising from the Games can bring people together and have a positive impact on how people perceive their communities, their city and their quality of life (EdComs, 2007: 19 & Johnson, 2008: 23). Other means of generating social inclusion was created through communal sports/cultural facilities and creating new connections within and across the valley (Moor, 2006: 155 & Salman, 2006: 39).

Enhancing the areas sense of place: This layer reveals how the proposals have celebrated the areas unique spatial characteristics, in order to create a sense of place. The lower Lea Valley precinct lost many of its rivers into drains during the Victorian era. This is similar to the removal of the watercourse in the Kings park precinct. The reintroduction of the rivers and canals into the area will not only enhance the 'green' credentials of the area, but also enhance the unique character of the area . The

waterways will provide new experiences in recreation and aesthetic pleasure. Rivers will run through the park and the canals through built areas, creating an integrated urban water environment (Fig 5.4) (Moor, 2006: 155 & Puckett, 2006: 21).

FIG 5.4: THE REINTRODUCTION OF THE ORIGINAL WATERCOURSE ENHANCES THE UNIQUE CHARACTER OF THE AREA (LONDON 2012, 2008: 1).

The built form of the facilities have been designed to follow the existing landscape and topography of the area, this strategy has two definite advantages; preserving the characteristics of the area and keeping the cost of the earth-moving process down (Dorrell, 2006: 12). According to Foreign Office Architecture (FOA) director, Alejandro Zaero-Pollto, "The overall design concept grew out of an appreciation of the areas distinctive existing topography and spatial qualities. *It has a geometry of meandering striations of the river, canal, drainage channels, roads and railway lines, which all run north to south. We wanted the buildings to grow out of this landscape so that they are determined fundamentally by the context, rather than stand as objects displayed on a platform.*" (Fig 5.3) (Spring, 2005: 12).

A braided grid acts as an organizing structure, weaving throughout the park, and merging the Olympic venues, concourse, canals, roads, bridges and landscape. The natural curved forms throughout the landscape resemble the muscles and veins of the human body, and they communicate the idea of physical strength, sport and movement. Making the spatial characteristics present in the Lea Valley, the very concept of the London Olympics and Lea Valley Park. Landscape as a consistent design element in all the venues will ensure that the venues produce a coherent whole, rather than a series of arbitrary structures (Spring, 2005: 12 & Zaero-Pollto, 2005: 1).

Flexibility: Due to the varying nature of each proposal, it was necessary to incorporate flexibility both into the urban design and built form. Several of the solutions included:

- Two of the three multi-sport arenas where designed as a kit of parts. Allowing them to be reused elsewhere after the Games. The close proximity to a railway and harbour allows for efficient transportation of the parts in an environmentally frugal way. (This strategy would therefore work well in the Kings Park precinct due to the close proximity to rail and harbour facilities).

- The aquatics centre will include two 50m swimming pools, a 25m diving pool and 20,000 seats for spectators (Fig 5.5). After the Games the seating will be reduced to 3,500 to allow for a wellness centre and other facilities which will be open to the local community.

- The international broadcast and press centre has been designed to be easily converted into offices, which would create much needed job opportunities in the region.

FIG 5.5: LONDON AQUATICS CENTRE, DESIGNED BY ZAHA HADID (LONDON 2012, 2008: 1).

- The pedestrian movement paths will need to be wide enough for the vast amounts of spectators during the games. After the event, paths will be reduced to allow for more green public open space

FIG 5.6: THE PEDESTRIAN MOVEMENT PATHS BEFORE AND AFTER THE GAMES (LONDON 2012, 2008: 1).

- The 6000 unit Olympic Village, which will accommodate athletes and visitors; will be transformed into a mixed use precinct; providing much needed housing and densification in the region. The housing will be arranged around communal squares and will accommodate a mixture of tenants, 30% will be low income and the rest will be middle to high income (Puckett, 2006: 19 & Salman, 2006: 35).

FIG 5.7: THE OLYMPIC VILLAGE WHICH WILL BE TRANSFORMED INTO A MIXED USE PRECINCT (LONDON 2012, 2008: 1).

Reconnecting the city through linkage: A primary objective to the project was to provide connections to the rest of the city that have eluded the area for so long. Thereby reintegrating the area back into the surrounding urban fabric. The valley is well served by strategic transport infrastructure, yet its internal transport system is almost non-existent. A series of new landscaped linkages, will tie together the 'isolated islands' that constitute the Lea Valley, in the form of a new road network, bridges, pedestrian and cycle routes. The new linkages will re-integrate the surrounding communities and generate huge social, economical and environmental benefits through increased accessibility (Moor, 2006: 155-156 & Zaero-Pollto, 2005: 1).

The four key aims of these connections are 1) to link the Lea Valley area to the Thames; 2) to connect the park to the wider green space network of the city; 3) to take advantage of the waterways and natural topography in facilitating linkage; and 4) to encourage active and intense use of green areas. It does this by setting up a networked park structure, which will be designed to link destinations and incorporate a great diversity of spaces. Unlike many conventional parks there will be no 'green deserts'.

It is not only external connectivity that is critical. Linking between facilities will create symbiotic relationships which is important in creating more efficient and well used facilities (Moor, 2006: 155-156).

This layer would be particularly relevant to the disconnected green space of Kings Park. These linkages would reintegrate the Kings Park district with surrounding nodes, thereby creating an efficient, vibrant and safe precinct.

Compact, Mixed Use communities: A key priority of the masterplan was to ensure there would be no white elephants once the games had ended. After 2012, many existing low-intensity uses of the area will be relocated, as they do not contribute to the liveliness of the public realm. Instead they will be replaced by a compact mixed use framework which will bring in offices, restaurants and retail areas, 9 000 new homes, improved public transportation and better-quality public open space (Moor, 2006: 156 & Salman, 2006: 35).

With regeneration of the area many new jobs, homes and social facilities for local people, will be provided, including new health and community centers, a 200 hectare park containing state-of-the-art sports venues and three new schools (Moor, 2006: 157).

This initiative is aimed at increasing the density of the area; thereby creating the critical mass necessary to support restaurants and other retail establishments in the precinct. The compaction of the urban fabric will create an efficient city structure able to knit into the surrounding districts.

Environmental Sustainability: This layer aims at meeting London's aspirations to become an environmentally sustainable city and demonstrates how London will facilitate the greenest Games ever. The scale of this development offers the opportunity to introduce innovative systems that demonstrate a new way forward for sustainable urban living. The focus of the proposals was to drive urban regeneration and revitalization throughout the areas of East London by incorporating a variety of strategies to alleviate environmental degradation (Johnson, 2008: 5 & Moor, 2006: 155-156).

The strategies incorporate alternate sources of energy, which will generate 40% of the power needed for the area. One of the systems will harvest wind power by introducing 130m high wind turbines each capable of powering 1200 homes a year. Other systems of harvesting renewable energy include; ground source heating, cooling through water, and photovoltaic cells for capturing solar energy. The architecture throughout the area has been designed to reduce energy demands and incorporate environmentally responsible materials. To reduce waste, 90% of demolition material will be re-used in future structures or recycled (Johnson, 2008: 21 & Puckett, 2006: 20).

The aim of the proposals was to protect and enhance the biodiversity and ecology of the region by maximising positive impacts on land, water and air quality. The built environment was designed to be integrated within the natural landscape and water systems, both systematically and aesthetically. Access to public transport was improved and the precinct was made a pedestrian friendly environment accessible to all. The area was infused with a mixture of uses and activities in order to create a safe, well used urban environment. The focus of the precinct was towards sporting and cultural activities, health and recreation (Johnson, 2008: 21 & Puckett, 2006: 21).

Conclusion: The Olympic and Legacy Masterplans would bring forward one of the largest and most significant urban regeneration projects ever undertaken in the UK. The Games would transform the Lower Lea Valley into a vibrant new urban precinct and a place of local and national pride. The objective is to lay the groundwork for sustainable communities that will offer current residents a greatly improved quality of life. Following the Games, residents should enjoy a legacy of dramatically improved physical environments, social infrastructure, and economic viability (Moor, 2006: 157).

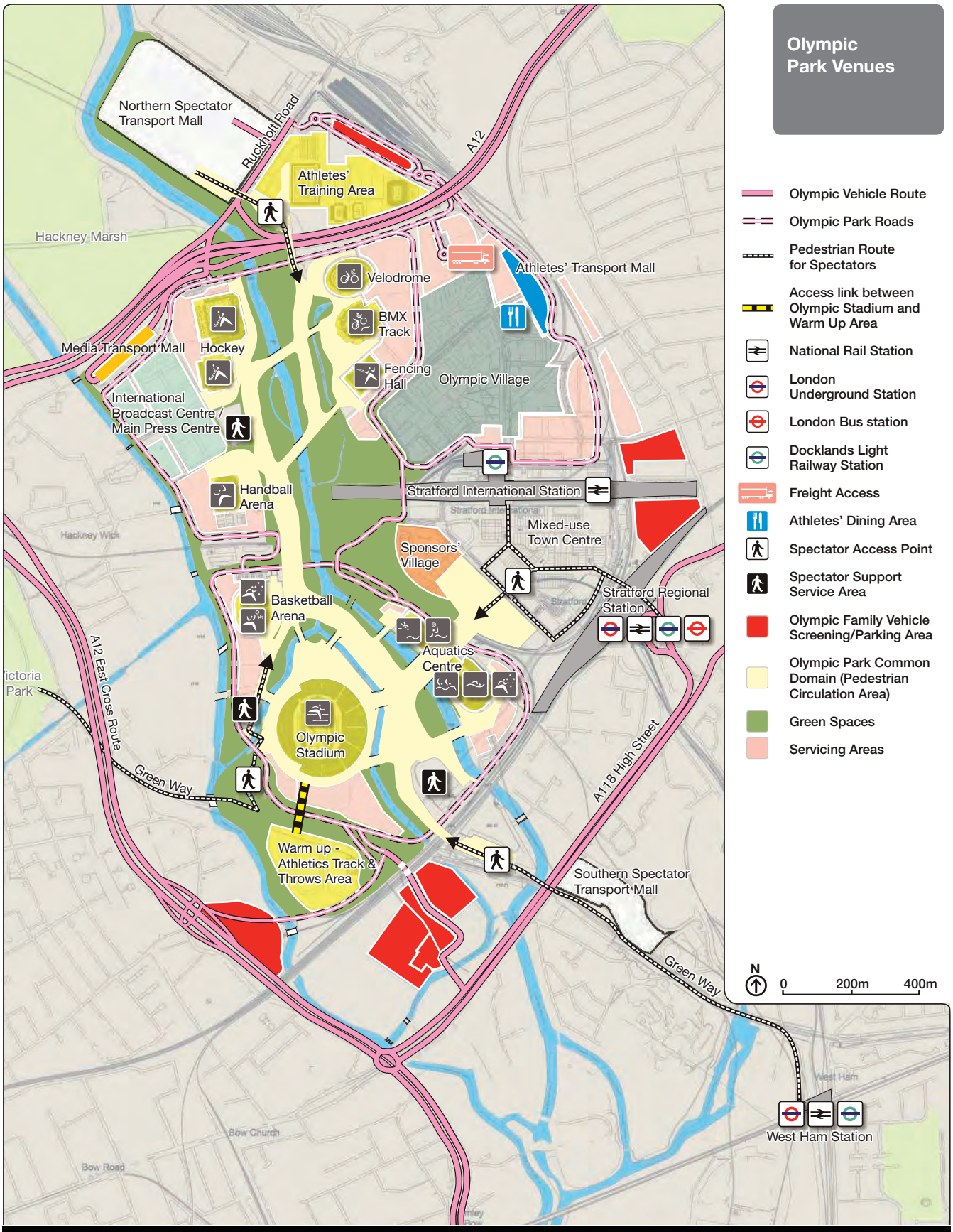


FIG 5.8: LONDON OLYMPIC MASTERPLAN INDICATING VENUES AND FACILITIES DURING THE GAMES (LONDON 2012, 2007: 1).

FIG 5.9: LEGACY MASTERPLAN AFTER THE GAMES SHOWING RETAINED OLYMPIC FACILITIES, ADDITIONAL PARKLAND AND DEVELOPMENT AREAS (LONDON DEVELOPMENT AGENCY, 2007: 1).

5.2 CATALYST FOR URBAN REVITALISATION, SITE SELECTION, SPATIAL RELATIONSHIPS AND FLEXIBILITY.

5.2.1 ICELAND SPORTS ACADEMY:

Introduction: The 2700m^2 Iceland Sports Academy in Reykjanes, is an example of how sports infrastructure can act as a catalyst for urban development. Designed by Arkitektur.Is, it reveals required facilities and unique spatial relationships within the tertiary education component of the HPC. It also informs site selection and ways of achieving flexibility within the teaching spaces.

Urban Catalyst: In September 2006, the United States closed their naval base in Reykjanes and with that 900 jobs disappeared. The hope was that the Sports Academy would act as one of the urban catalysts and a starting point for an entirely new sports city. The scientific jobs, which the scheme entails, should attract people with higher education's and thus a lot of students, which will add valuable density to the area. In the sixty-hectare sports precinct one can already find evidence that the sports academy has become a valuable catalyst for local development in Reykjanes. Many of the subsequent projects comprise of a number of sports facilities including; a covered soccer field (Fig 5.10), a swimming complex, and Formula 2 track. Development of non-sports related infrastructure is also underway, including 1,820 homes, three new schools, a music centre, a community centre and new university campus, all of which should result in a more positive urban life in the area (Fasteign, 2009: 1 & Keiding, 2006: 537).

FIG 5.10: A COVERED SOCCER FIELD WAS ONE OF THE SUBSEQUENT PROJECTS DUE TO THE INTERVENTION OF THE ICELAND SPORTS ACADEMY (RIKKA, 2008: 1).

Site Selection: The architects of the project, Arkitektur.Is, placed much emphasis on not only integrating the project locally, but also in the global network. Therefore in trying to find the right location for the building they placed much weight on the close connection to the outside world and as a result, the project location is only ten kilometres from the main airport of Keflavik.

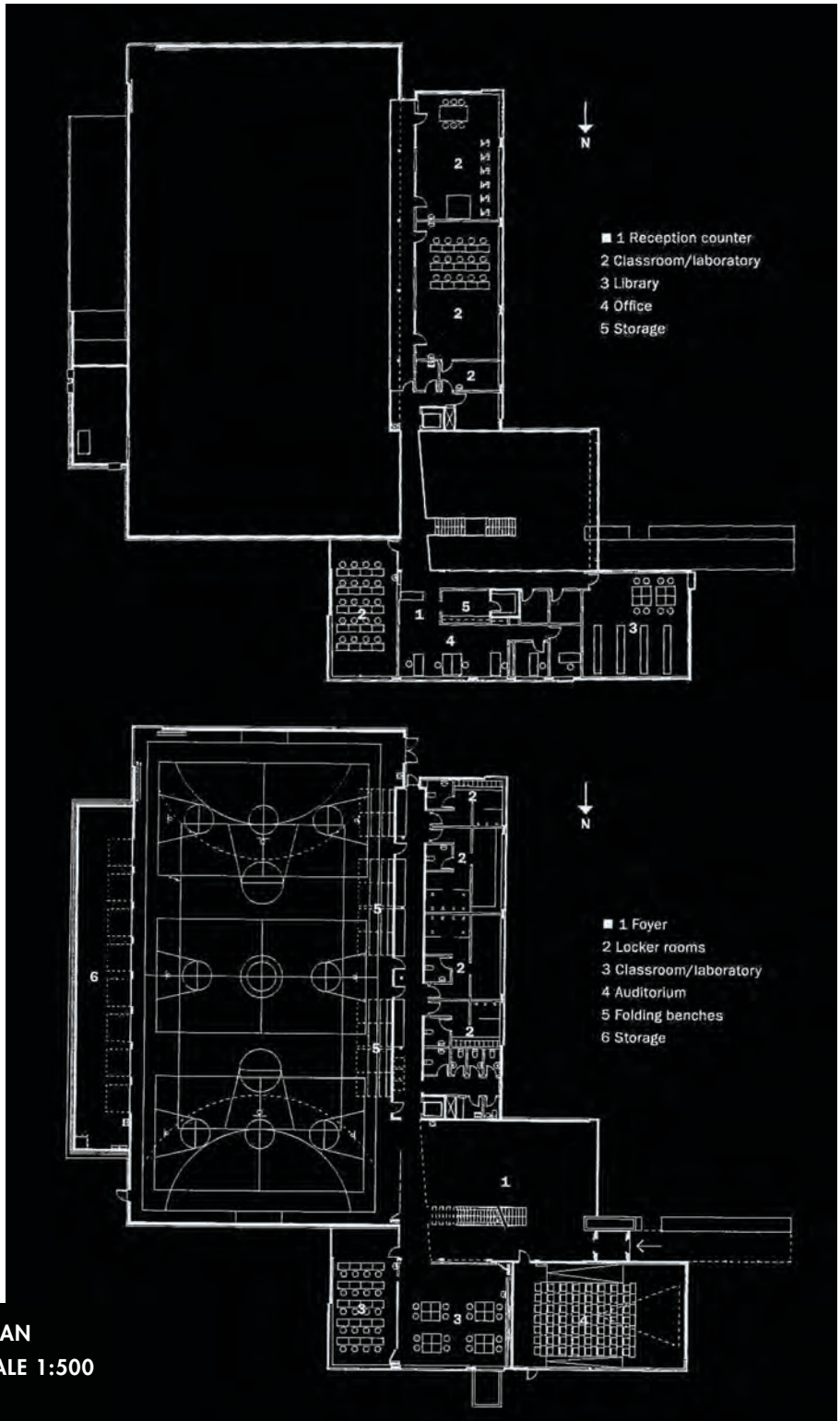


FIG 5.12: ABOVE - FIRST FLOOR PLAN BELOW - GROUND FLOOR PLAN. SCALE 1:500 (ARKITEKTUR.IS, 2006: 556).

FIG 5.11: THE TWO SEPARATE VOLUMES OF THE FACILITY (LUND, 2006: 1).

Spatial Relationships: This building reinforces the school's identity as an athletic college. Students not only study sports in this facility, they actively pursue the science of athletic, health and physical education along with the human body, where the sports hall is the centre of this learning space (Fig 5.13). The building's transparency and limited number of stationary walls allow it to create a relationship between the surrounding landscape and the interior, and to stimulate learning through unhindered movement (Fig 5.18) (Keiding, 2006: 543). The Sports Academy maximises social interaction and festivity with its mixture of activities. Almost all angles reveal people in either physical activity or engaged in teaching, conversation, lectures, studying, reading or realization. It offers a picture of a more unified form of learning, where sports previously sharp separation of body and mind is now passé (Keiding, 2006: 545).

From the outside, the building is seen as two separate volumes. The sports hall is seen as a large rust-coloured volume with a ceiling-high corner window . The remainder of the building is a white concrete volume devoted to classrooms, library, and various other programmatic needs (Fig 5.11). Throughout the build form there are apertures to the outside, this allows glimpses of what the building's internal spaces are used for. On the interior the space is much more open allowing a dynamic, flowing, and adaptable space to evolve within. Glass walls and movable walls add to this impression, and allow the space within to move as the needs of education change (Wolff, 2007: 1).

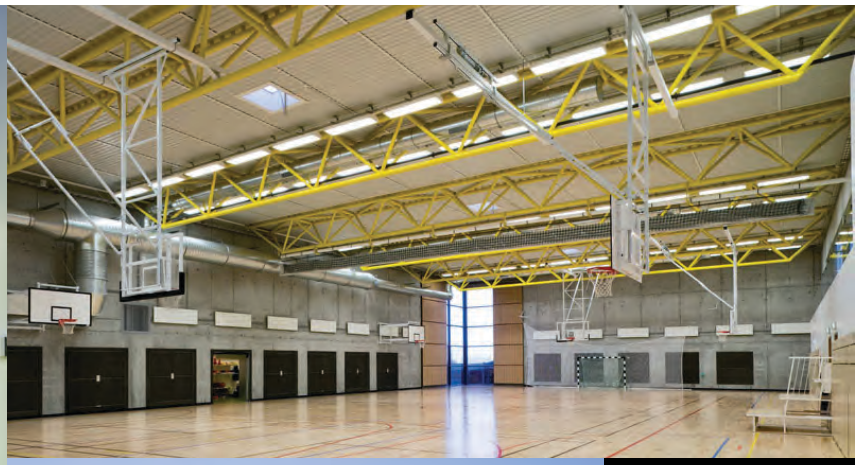


FIG 5.13: RIGHT ABOVE - THE SPORTS HALL IS THE HEART OF THE LEARNING SPACE (LUND, 2006: 1).

FIG 5.14: LEFT ABOVE - WALKWAY AND CLASSROOMS OVERLOOKING THE SPORTS HALL (LUND, 2006: 1).

FIG 5.15: LEFT BELOW - CORNER WINDOW OF THE LARGE RUST COLOURED VOLUME ALLOWS VIEWS TO THE ACTIVITIES WITHIN (LUND, 2006: 1).

FIG 5.16: THE ENTRANCE IS COMPOSED OF A SERIES OF TRANSPARENT SCREENS, RVEALING THAT THE INTERIOR IS NOT DIVIDED BUT OPEN AND INTERCONNECTED (LUND, 2006: 1).

Flexibility: To accentuate the educational program, the educators stressed that the classrooms should all have immediate connections with the sports hall. Though they do not open directly into the athletic space, movable walls and an open hallway on the second floor allow the classrooms to be part of the open space of the sports hall (Fig 5.13). The intention is to stimulate learning through a constant motion and interconnectivity. The learning spaces become flexible due to the movable walls which allow them to both open into the public spaces and to change size as the needs of classes change. The students meet, socialize, study and eat in the foyer. Additionally, classes can also spill into it to include more people or to provide more active learning space. Similarly, the activity of the common space can be extended to an unused classroom or two by opening up the space (Wolff, 2007: 1).

FIG 5.17: CLASSROOMS HAVE MOVEABLE WALLS WHICH ALLOW FOR FLEXIBILITY AND ADAPTABILITY OF SPACE (LUND, 2006: 1).

As architectural critic Randy Fielding noted, *"The connection between the circulation area and sports hall on the 2nd floor is a marvellous illustration of transparency and the value of enriched, stimulating environments for learning; with its low glass rail, skylight, green floor, blue and red-orange paint, it's a notable exception to the typical corridor along a gym."* (Fig 5.13) (Wolff, 2007: 1).

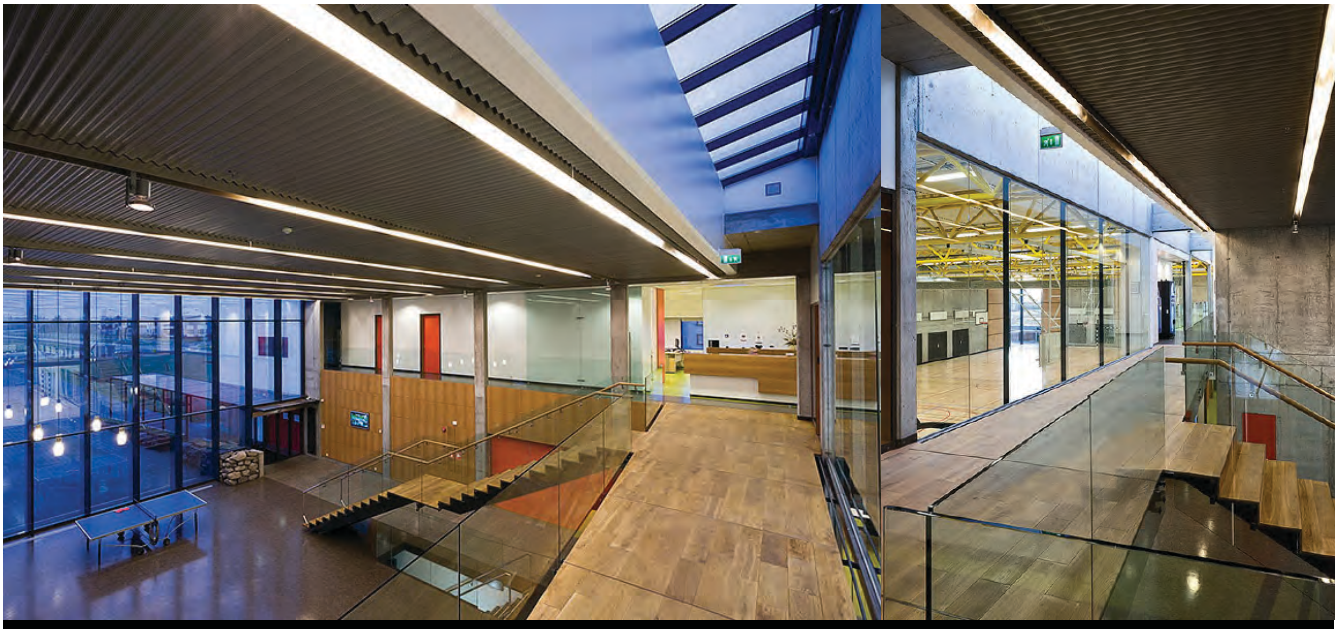


FIG 5.18: VISUAL CONNECTIONS BETWEEN INSIDE AND OUT, AS WELL AS BETWEEN VARIOUS FUNCTIONS WAS A PRIMARY OBJECTIVE WITHIN THE DESIGN. THIS STIMULATES LEARNING WHILST INCREASING VIBRANCY WITHIN THE SPACE (LUND, 2006: 1).

Conclusion: This precedent reveals many issues pertaining to the proposed HPC. It shows that this type of sports infrastructure can become a catalyst for urban revitalisation within an area of decline. It informed the research of the importance of local and global network connections through various transport linkages i.e. airport. It demonstrated unique spatial relationships and flexibility throughout the project, emphasising adaptability and visual connections between spaces (Fig 5.18).

5.3 ARCHITECTURE AS AN EXTENSION TO THE NATURAL ENVIRONMENT.

5.3.1 THE ROBERT L. PREGER INTELLIGENT WORKPLACE

The Robert L. Preger Intelligent Workplace (IW) (Fig 5.19), designed by Hartkopf and Loftness Architects in 1997, is a 605m^2 model of how technology can be combined with passive strategies for climate control in buildings. The architects saw conventional office buildings to be inadequate 'if they were measured through the senses of the occupants.' Seeking an alternative, the IW of the Carnegie Mellon University, Pittsburgh is a constantly evolving experiment for Building Performance and Diagnostics, aimed at preserving the environment, improving users health and quality of life, and is described as a 'living, lived in laboratory' (Gissen, 2002: 124 & Hartkopf, 2005: 1 & Skirble, 2009: 1).

FIG 5.19: THE ROBERT L. PREGER INTELLIGENT WORKPLACE ON THE ROOF OF CARNEGIE MELLON UNIVERSITY SCHOOL OF ARCHITECTURE (GISSEN, 2002: 125).

"The IW is a wonderful place to work, with daylight throughout, fresh air on demand, spectacular views over the campus, and the ability to adapt spaces and technologies as needed," said architecture professor, Stephen Lee (Fig 5.20) (Skirble, 2009: 1).

FIG 5.20: SKYLIGHTS AND OPEN WINDOWS BRING NATURAL LIGHTING DEEP INTO THE INTELLIGENT WORKPLACE (SKIRBLE, 2009: 1).

The building utilizes a modular grid construction and flexible systems such as modular furniture, floors and walls which can be easily moved around to allow for varying spatial configurations (Fig 5.21) (Skirble, 2009: 1).

The IW is designed to use smart systems to create the highest level of personal health and comfort. A system of intelligent internal and external senses monitors temperature, air quality, wind speed, and humidity, making the building incredibly responsive to its environment. A central computer system is tapped into these senses; controlling artificial and natural lighting, optimising airflows, shading, heating and cooling, depending on the users need and environmental forces. This marriage of high and low tech strategies actively enmeshes the building in local energy flows, tapping into the surrounding to the advantage of all its inhabitants. By using modular systems and designing the building to react to its surroundings it remains flexible and adaptable for different circumstances and environmental conditions (Gissen, 2002: 124 & Skirble, 2009: 2).

The IW fuses passive strategies with an advanced energy-efficient enclosure, heating, ventilation, air-conditioning and lighting technologies with innovative distributed energy generation systems, such that all of the building's energy needs for heating, cooling, ventilating and lighting are met on-site, maximizing the use of renewable energies (Fig 5.23) (Hartkopf, 2005: 6, 7). Senior researcher Azizan Aziz said the IW will generate more energy than it uses, making it an exporter of energy. The IW accomplishes this feat with passive design strategies *(orientation, shading*

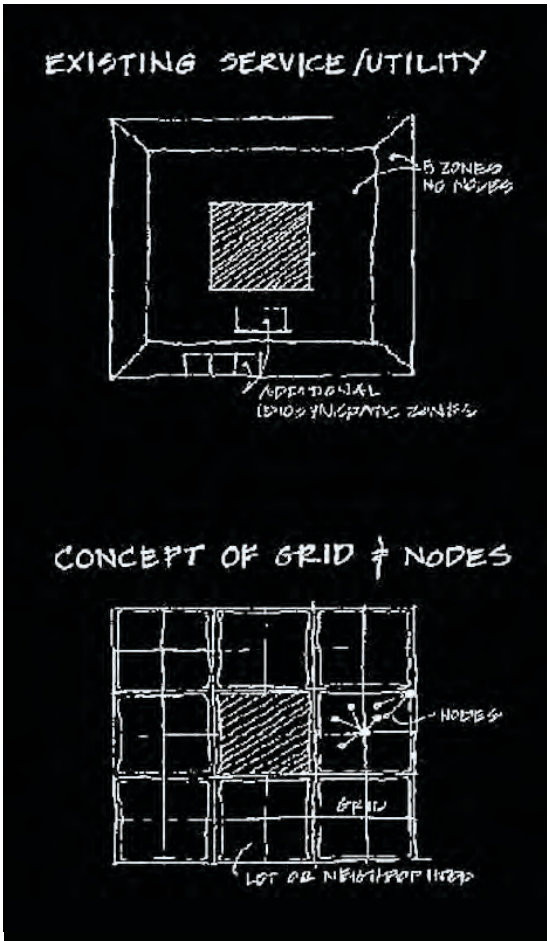


FIG 5.21: CONVENTIONAL LARGE ZONE APPROACHES TO THERMAL CONDITIONING AND LIGHTING ARE INCAPABLE OF ACCOMMODATING THE DYNAMICS OF TECHNOLOGY, WORKSTATION DENSITY AND TEAMING CONCEPTS. THEREFORE FLEXIBLE GRIDS AND NODES SHOULD BE USED (HARTKOPF, 2005: 3).

FIG 5.22: BASEMENT BIO DIESEL FUEL LABORATORY PROVIDES ENERGY TO THE INTELLIGENT WORKPLACE (SKIRBLE, 2009: 1).

, fenestration and massing to minimize the lighting, cooling and heating loads), maximizing onsite renewable energy *(advanced photovoltaic, solar thermal, and geo-thermal systems)* and generating energy through an 'energy cascade' system that uses reject heat to create power. The building's power generation system utilizes reject heat from the bio-diesel fuel cell (Fig 5.22) to generate steam, which is used to drive a steam turbine, reject heat will also be used to drive dehumidification cooling, absorption chiller and refrigerant systems; and finally the resulting reject heat is used for heating internal spaces and water (Hartkopf, 2005: 6, 7 & Skirble, 2009: 1).

The IW therefore demonstrates how a building can be integrated into the natural systems of a particular place by fusing both passive techniques and advanced technology.

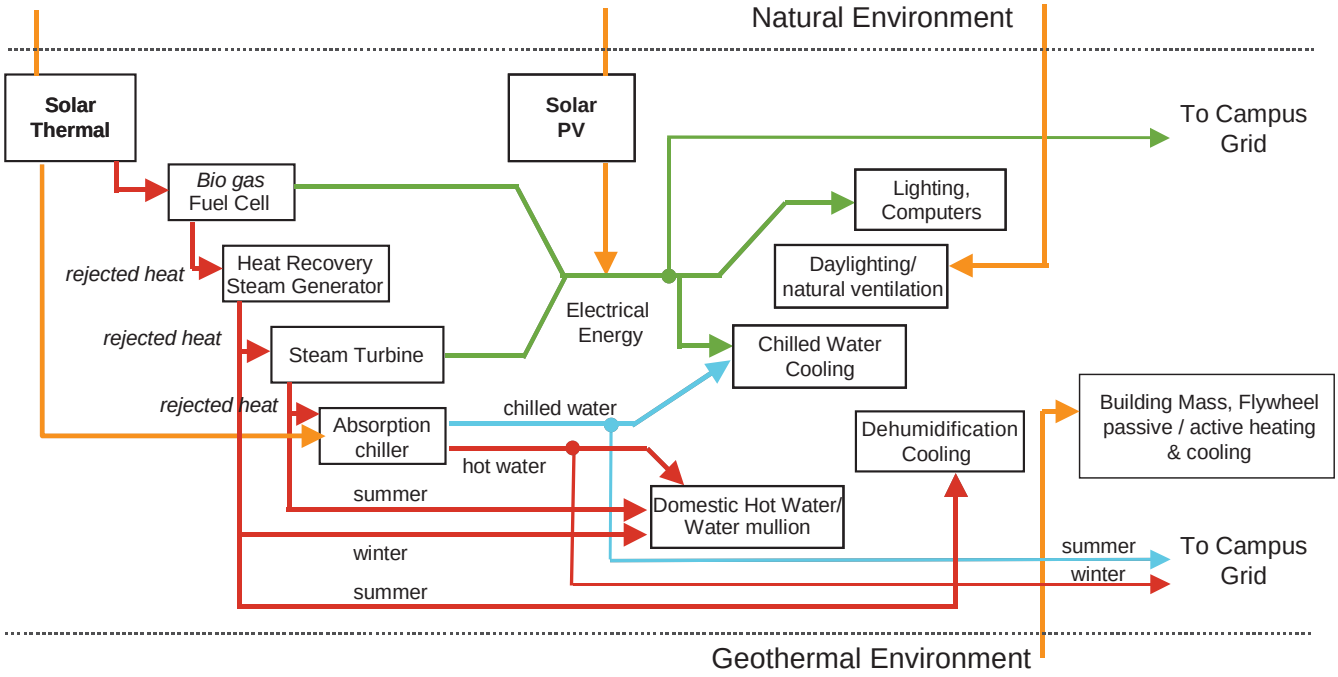


FIG 5.23: BUILDING AS POWER PLANT - CONCEPTUAL SCHEME FOR A BUILDING-INTEGRATED 'ASCENDING-DESCENDING' ENERGY SYSTEM (HARTKOPF, 2005: 6).

5.4 APPROPRIATE ENVIRONMENTAL TECHNOLOGIES AND STRATEGIES FOR THE BUILDING TYPOLOGY AND CONTEXT.

The following technologies/strategies will be investigated in order to enhance the environmental performance, whilst benefiting the users of the proposed HPC:

- Utilizing Human Energy: Energy Generating Dance Floor and Human-Powered Gym.
- The Integration of Plant Life in Architecture: Green Walls, both internally and externally, and Roof Gardens.
- Architecture as Media Technology.
- Other Relevant Technologies: Heat Exchange, Water Conservation, and Geothermal Heat Exchangers.

5.4.1 UTILIZING HUMAN ENERGY

Energy Generating Dance Floor: The phrases "night club" and "renewable energy" are not often heard in the same sentence, however the world's first sustainable night club, 'Club Watt', has recently opened in Rotterdam, the Netherlands (Pilloton, 2007: 1).

'Club Watt' features a variety of sustainable strategies that include the use of energy-efficient LED lighting instead of power intensive spotlights, a minimal-waste-bar which uses recycled materials and only serves drinks on tap, waterless urinals and a rainwater catchment system which supplies water-saving toilets. However the club's most notable feature is the dance floor, which converts dancer's kinetic energy into electrical energy (Fig 5.24). It achieves this by harnessing the force generated by the users movements, which activate a subfloor system made of crystals which in turn generate small

FIG 5.24: THE DANCEFLOOR CAPTURES THE KINETIC ENERGY OF THE USERS AND CONVERTS IT TO ELECTRICAL ENERGY (HALSE, 2008: 1)

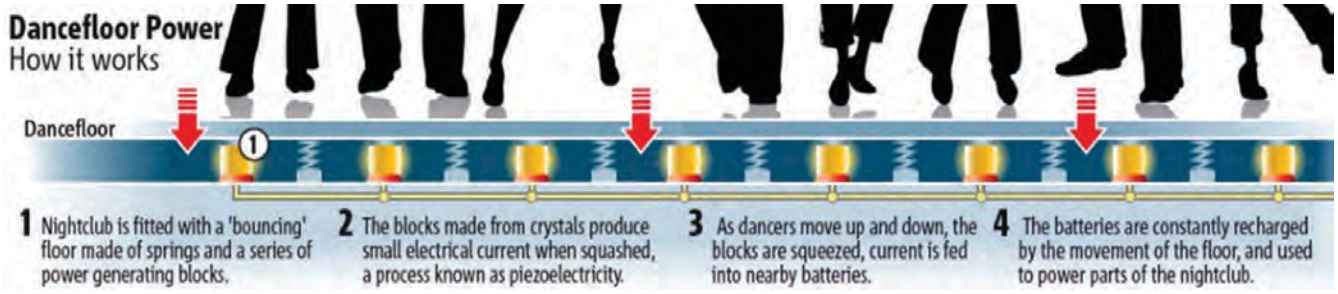


FIG 5.25: DIAGRAM OF HOW THE DANCEFLOOR GENERATES POWER (GLYNN, 2008: 1).

electrical currents when squashed. These electrical charges are then stored in batteries which are used to power LED lights in the dance floor and interior, as well as other small auxiliary systems such as computers (Fig 5.25). These systems have halved the clubs water consumption and CO_2 emissions, save 30% on energy consumption, and reduced waste by 50% (Halse, 2008: 2 & Sommariva, 2009: 66).

This system would allow for a wide variety of opportunities essentially in areas of high traffic volumes and activity such as movement paths, sports halls and aerobic studios.

Human-Powered Gym: Just as the Sustainable Night Club is turning dance steps into energy, French inventor Lucien Gambarota is bringing clean, sustainable energy to the gym; by harnessing human energy. Hong Kong's California Fitness has launched an innovative "Powered by YOU" program, which enables users to improve their health and the environment simultaneously, by turning human energy into usable electric energy (Levesque, 2007: 1 & 2008: 1).

By connecting the gym equipment; such as the step, cycling (Fig 5.26) and cross-training machines to wind-generator motors, kinetic energy is converted to electrical energy. Users generate enough electricity to power music systems or lighting fixtures, while excess energy is stored in a battery (Levesque, 2007: 1 & 2008: 1).

According to Steve Clinefelter, President of California Fitness, "*One person has the ability of producing 50 watts of electricity per hour when exercising at a moderate pace….If a person spends one hour per day running on the machine, he/she could generate 18.2 kilowatts of electricity and prevent 4,380 litres of CO^2 released per year. We love the idea of burning calories in order to not burn fossil fuels.*" (Levesque, 2007: 1).

FIG 5.26: ENERGY GENERATING EQUIPMENT (LEVESQUE, 2007: 1).

5.4.2 THE INTEGRATION OF PLANT LIFE IN ARCHITECTURE

Introduction: As seen in the previous chapter on Healthy Architecture – Healthy Environment (page 95) , architects need to increase the vegetation or biomass within the built form. This will improve physical and physiological health of the users, whilst becoming an extension to the natural surroundings, particularly of the Kings Park Precinct.

Many do not recognise air as a limited resource, and fail to take responsibility for maintaining air quality by cleaning polluted air - as seen in China (Fig 5.27). As trees and other plant life – the planets natural systems for cleaning air – are destroyed and replaced by polluting infrastructure the problem becomes even more acute. It therefore becomes the architect's responsibility to maximise the vegetation (biomass) within the built form, in order to maintain a natural ecological balance. This green infrastructure holds the promise of a new type of 'living' architecture (Gissen, 2002: 43 & Sharp, 2008: 3).

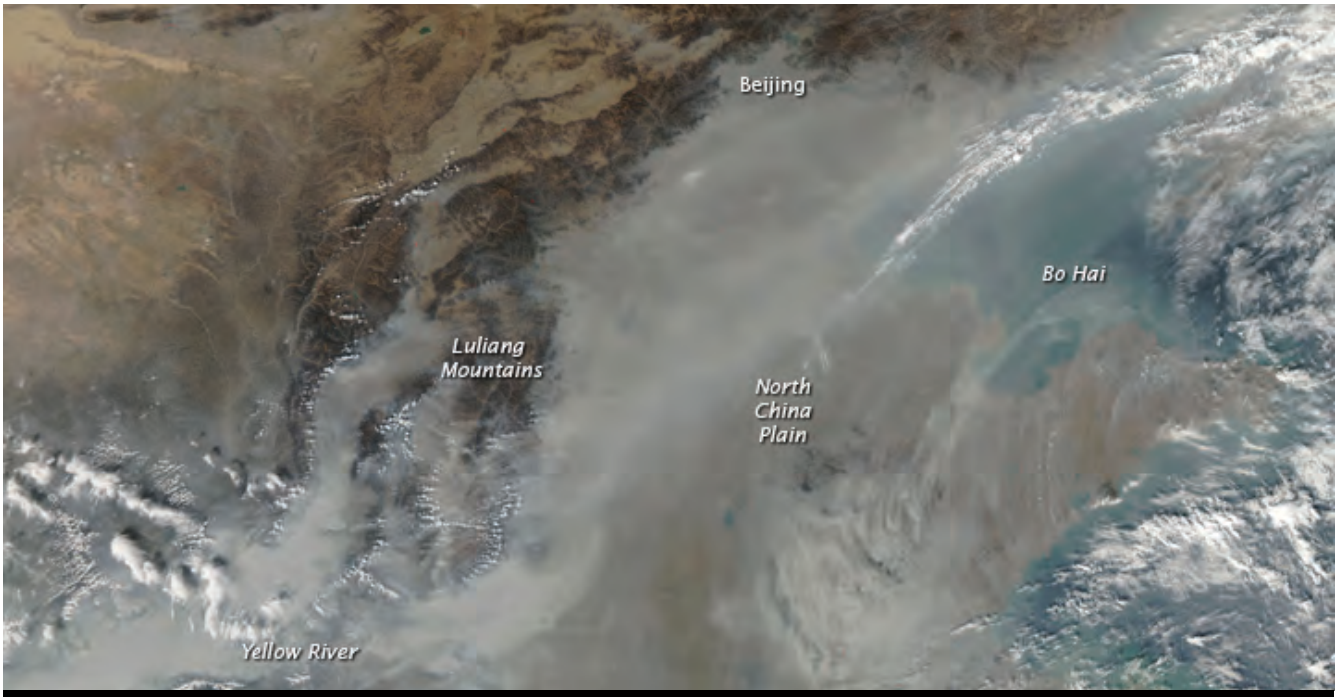


FIG 5.27: NASA'S SATELLITE OF THICK HAZE AND SMOG OVER CHINA - OCTOBER 28, 2009 (BEACH, 2009: 1).

Unfortunately plants and buildings do not naturally assimilate, but there are many advantages to their integration. The potential physical benefits include; passive cooling (Fig 5.32), power generation, storm water retention, insulation, increased bio-diversity, acoustic absorption and greatly improved energy efficiency. It would also filter pollution, absorb carbon dioxide and produce revitalizing oxygen (Fig 5.30) & (Fig 5.31). The cooler, quieter and less polluted atmosphere makes opening windows

more attractive than using filtered air-conditioners, further reducing energy consumption. Along with these benefits, deciduous climbing plants provide distinct seasonal advantages over metal sunshades. Dense foliage shelters the building from excessive solar gains during the summer, while the shedding of leaves in the winter allows direct solar heat gains (Fig 5.28) (Affleck, 2008: 78 & Gissen, 2002: 44 & Schittich, 2008: 1455).

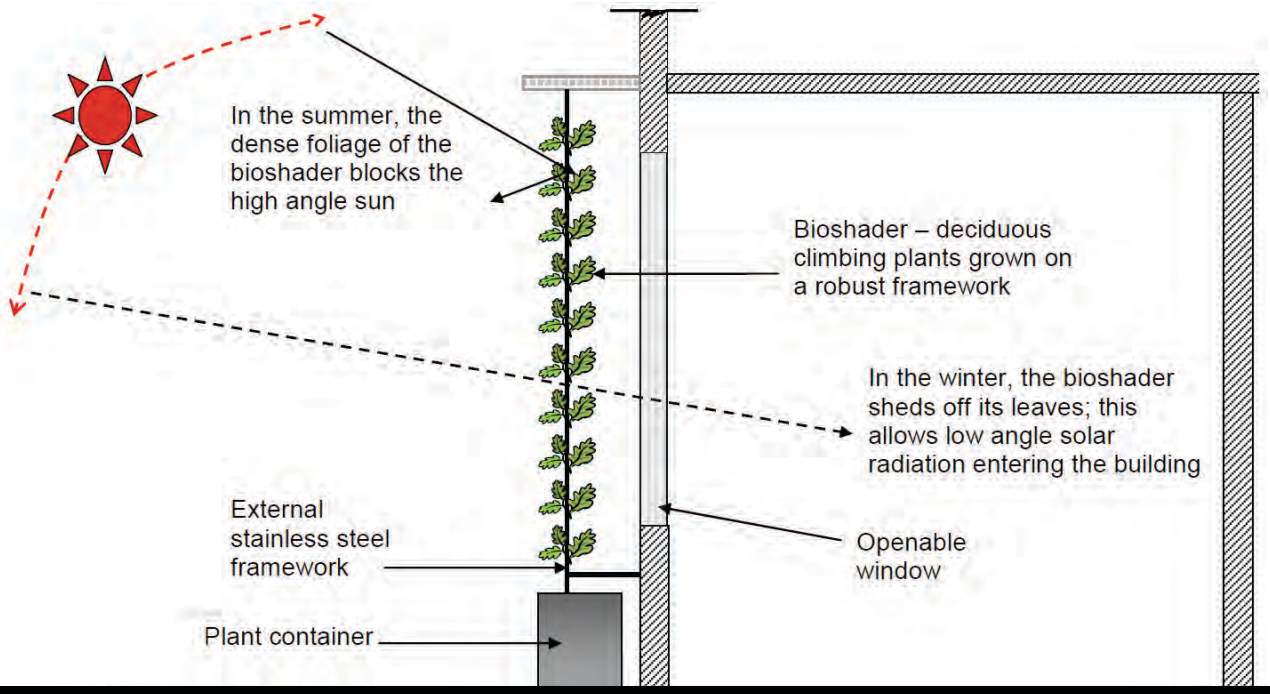


FIG 5.28: A VERTICAL SECTION THROUGH THE A BIO-SHADER (MILLER, 2004: 27)

Various studies have shown that the presence of vegetation has important physiological, aesthetic and therapeutic benefits, such as; relaxation, reduced stress, better moods, softening both internal and external environments, creating more harmonious and inviting spaces and as a result has positive/uplifting effects on ones psychology, reduced mental fatigue and the effects of sick building syndrome (Gallagher, 1999: 81).

FIG 5.29: AN EXAMPLE OF A VEGETATED FACADE IN MADRID, SPAIN. BUILT BY SWISS ARCHITECTS HERZOG & DE MEURON. PATRICK BLANC CREATED THE 'LIVING FACADE' (THIEMANN, 2008: 215)

The benefits accrued by a green wall depend on design factors that include leaf area, leaf density, site conditions and the scale of the project. Some benefits are shared by almost all green walls, herein referred to as 'common benefits'; while others are a function of the particular design/client objectives, herein referred to as 'design specific benefits'. The discussion of common green wall benefits has been divided further into two major categories: **Public** and **Private,** since some benefits are for the building occupants while others are shared by the community at large.

FIG 5.30: TABLE SHOWING PUBLIC BENEFITS OF GREEN WALLS (SHARP, 2008: 13)

Area of Impact	Description	Benefits
Reduce Urban Heat Island Effect	The temperature increase in urban areas caused by the replacement of "natural vegetation with pavements, buildings, and other structures necessary to accommodate growing populations." This results in the conversion of sunlight to heat. Vegetation cools buildings and the surrounding area through the processes of shading, reducing reflected heat, and evapotranspiration.	▪ Promotes natural cooling processes ▪ Reduces ambient temperature in urban areas ▪ Breaks vertical air flow which then cools the air as it slows down ▪ Shading surfaces/people
Improved Exterior Air Quality	Elevated temperatures in modern urban environments with increasing numbers of vehicles, air conditioners and industrial emissions have led to a rise in nitrogen oxides (NOx), sulphur oxides (SOx), volatile organic compounds (VOCs), carbon monoxide (CO) and particulate matter.	▪ Captures airborne pollutants and atmospheric deposition on leaf surfaces ▪ Filters noxious gases and particulate matter
Aesthetic Improvement	Green walls provide aesthetic variation in an environment in which people carry out their daily activities. Numerous studies have linked the presence of plants to improved human health and mental well being.	▪ Creates visual interest ▪ Hides / obscures unsightly features ▪ Increases property values ▪ Provides interesting free-standing structural elements, etc.

FIG 5.31: TABLE SHOWING PRIVATE BENEFITS OF GREEN WALLS (SHARP, 2008: 15)

Area of Impact	Description	Benefits
Improved Energy Efficiency	Improves thermal insulation capacity through external temperature regulation. The extent of the savings depends on various factors such as climate, distance from sides of buildings, building envelope type, and density of plant coverage. This can impact both the cooling and heating.	• Traps a layer of air within the plant mass • Limits movement of heat through thick vegetation mass • Reduces ambient temperature via shading and plant processes of evapotranspiration • May create a buffer against the wind during the winter months • Interior applications may reduce energy associated with heating and cooling outdoor air for indoor use.
Building Structure Protection	Buildings are exposed to the weathering elements and over time some of the organic construction materials may begin to break down, as a result of contraction and expansion shifts due to freeze-thaw cycles and UV exposure.	• Protects exterior finishes from UV radiation, the elements, and temperature fluctuations that wear down materials. • May benefit the seal or air tightness of doors, windows, and cladding by decreasing the effect of wind pressure.
Improved Indoor Air Quality	For interior projects, green walls are able to filter contaminates that are regularly flushed out of buildings through traditional ventilation systems. The filtration is performed by plants, and in the case of bio-filtration, micro-organisms.	• Captures airborne pollutants such as dust and pollen • Filters noxious gases and VOC's from carpets, furniture and other building elements
Noise Reduction	The growing media in living wall systems will contribute to a reduction of sound levels that transmit through or reflect from the living wall system. Factors that influence noise reduction include the depth of the growing media, the materials used as structural components of the living wall system, and the overall coverage.	
LEED®	Green walls contribute directly to achieving credits, or contribute to earning credits when used with other sustainable building elements. (See below)	
Marketing	Improved aesthetics may help to market a project and provide valuable amenity space.	

The idea of incorporating vegetation into architecture is not new, but advances in technology are allowing architects to increase biomass in the built form in a variety of innovative ways (Schittich, 2008: 1455).

Two systems of integrating plant life into the built form will be highlighted in this chapter. These include; green walls, both externally and internally, and roof gardens.

Green Walls: Green walls are a key component of 'living' architecture and will become increasingly important in our cities in the years to come. Green wall technologies provide a wide range of options for designers who are interested in using the architecture, to accomplish multiple objectives, both inside and out (Sharp, 2008: 29).

External Green Walls: Green facades take many forms (Fig 5.33) for various different applications and uses. Some uses include, solar protection (Fig 5.32), insulation, shading, noise reduction and aesthetic beauty. Other less conventional uses include farming, passive cooling, advertising and the generation of energy.

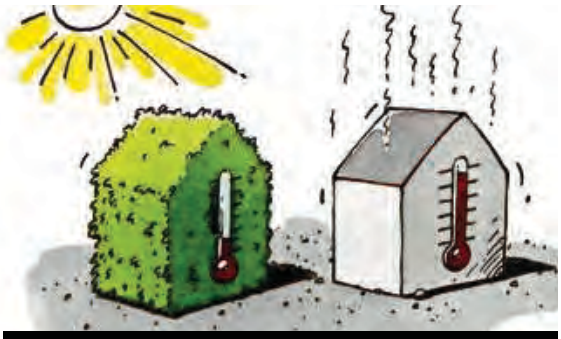


FIG 5.32: SOLAR PROTECTION PROVIDED BY GREEN FACADES (MILLER, 2004: 8)

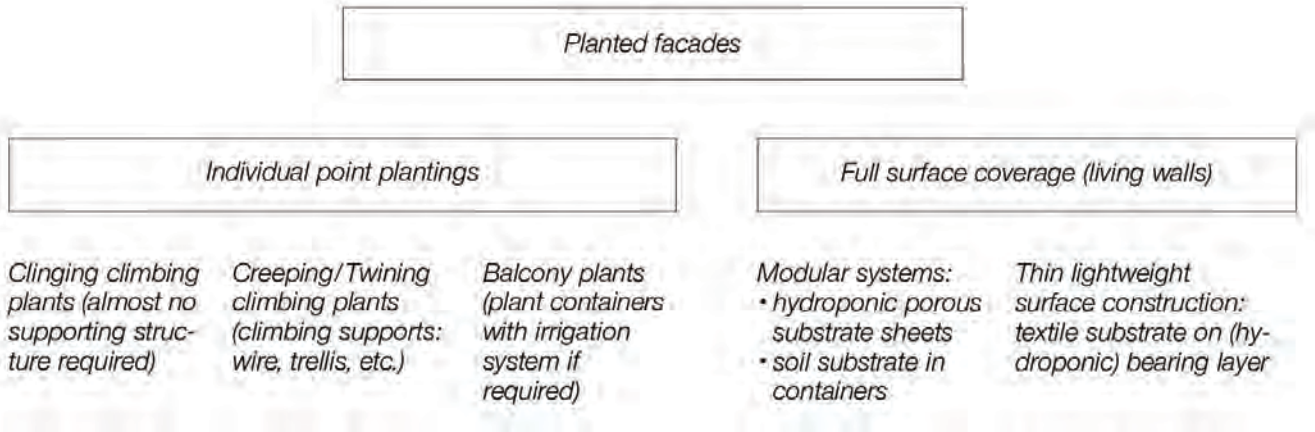


FIG 5.33: VARIOUS TYPES OF PLANTED FACADES (SCHITTICH, 2008: 1455)

Green walls have yet to be extensively studied as a forum for urban agriculture, but the potential benefits are obvious. Unlike conventional farming where large tracts of land are needed, green walls utilize verticality to maximise available surface area to grow a variety of crops. Vertical farms have been suggested for New York as a way of reducing the energy needed to transport fresh food to consumers (Fig 5.34). The higher concentration of CO_2 in and around cities will increase photosynthesis and the production rate of plants. If buildings were used to meet more of the planets food needs, some of the land now needed for cultivation could be left for nature and recreation (Affleck, 2008: 78 & Sharp, 2008: 20).

FIG 5.34: THE 'HARVEST GREEN PROJECT' BY ROMSES ARCHITECTS WAS A WINNING ENTRY IN 'THE 2030 CHALLENGE' TO ADDRESS CLIMATE CHANGE. IT IS AN EXAMPLE OF HOW TO INCORPORATE VERTICAL FARMING WITHIN AN URBAN ENVIRONMENT (JORDANA, 2009: 1).

Make Architects and Max Fordham Engineers are currently working on two separate projects which harness the power of plant life. The first project, Thorpe Business Park in Leeds, United Kingdom, features offices with external walls covered in dense vegetation which become part of the building's environmental system. In place of a conventional chilled beam system, this system passes the cooling agent (water) through a series of externally mounted panels that are permanently moistened by rainwater run-off in order to facilitate the highly efficient process of evaporative cooling. The combination of warmth and dampness created by the evaporative cooling process also creates the perfect environment for plant life, which is supported within a special panel fixed to the exterior of the evaporative cooling array (Fig 5.35).

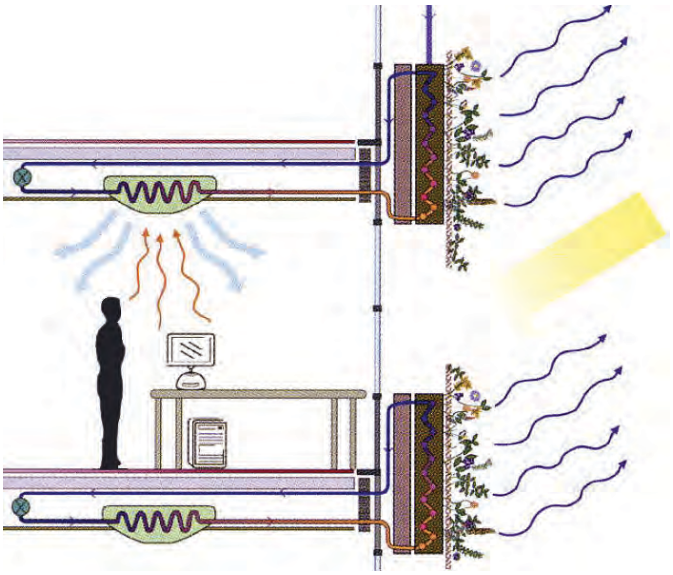
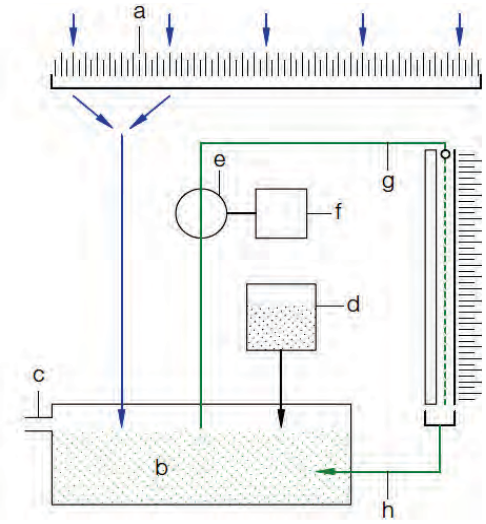


FIG 5.35: GREEN FACADE OF THORPE BUSINESS PARK, HAS AN INTEGRATED COOLING SYSTEM (AFFLECK, 2008: 79)

The plants are fed with nutrient-enhanced rainwater (Fig 5.36), these plants optimise the efficiency of the cooling process by increasing the overall area of the evaporative cooling as they grow. The vertical vegetation is trimmed several times a year, with the resultant matter fed into an anaerobic digester to produce a biogas that could be used to power the building (Affleck, 2008: 79).



a - rainwater
b - storage tank
c - overflow
d - nutrients
e - pump
f - computer control
g - nutrient solution for planted facade
h - return run

FIG 5.36: RAINWATER RECOVERY SYSTEM (SCHITTICH, 2008: 1455)

The second project, for an experimental Algae Tower (Fig 5.37), explores how architecture can integrated an even more efficient form of plant life with a host of applications. Algae are 200% more effective at absorbing CO_2 than conventional corn crops and do not drain natural resources at the same degree. They also grow at an exponential rate and can be harvested almost every hour to produce bio-fuels. Accordingly, this project proposes a building that is wrapped in a series of tubes containing an algae suspension (photobioreactors). The tubes are integrated into the cladding system as they help insulated and shade interior spaces; in return, they absorb both the heat generated by the building and the sunlight that falls on to them to create the perfect living conditions for algae, which are then collected, filtered and processed to generate bio-fuels to power the building. Single-celled algae can achieve a 20 per cent rate of energy transfer from sunlight, which is comparable to the best photovoltaic cells now available. One of the benefits to harnessing algae for bio-fuels is that it can use waste water and ocean water, and it is relatively harmless to the local environment should it spill or leak. The algae also have the potential to bring a fascinating element of colour and texture to the structure facade, producing an elevation that changes colour according to the lifecycle of the algae living within it: a perfect illustration of the dynamic and productive interface between nature and are built environment (Fig 5.37) (Affleck, 2008: 78-79 & Farmer, 2009: 1).

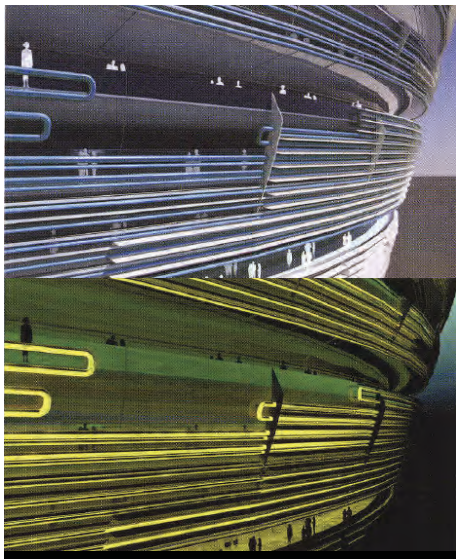


FIG 5.37: ALGAE FILLED TUBES WHICH WRAP AROUND THE EXPERIMENTAL ALGAE TOWER TO CREATE SHADERS, ABSORB CO^2 PRODUCE AND BIOFUEL. DIFFERENT SPECIES OF ALGAE RESULT IN DIFFERING WALL COLOURS, WITH SOME EXHIBITING BIOLUMINESCENCE (AFFLECK, 2008: 79)

The direct planting on a facade may lead to building damage caused by rooting systems. For this reason two primary systems have been developed for the cultivation of living walls:

- The First is a modular container systems in which the plants draw nourishment from the earth.
- The second is a modular hydroponic systems in which the nutrient is dissolved in water and fed directly to the roots, thereby eliminating the need for soil altogether (Schittich, 2008: 1455).

The modular form of construction facilitates greater flexibility, mobility and the opportunity to cultivate the plants before installation (Fig 5.38) (Schittich, 2008: 1459).

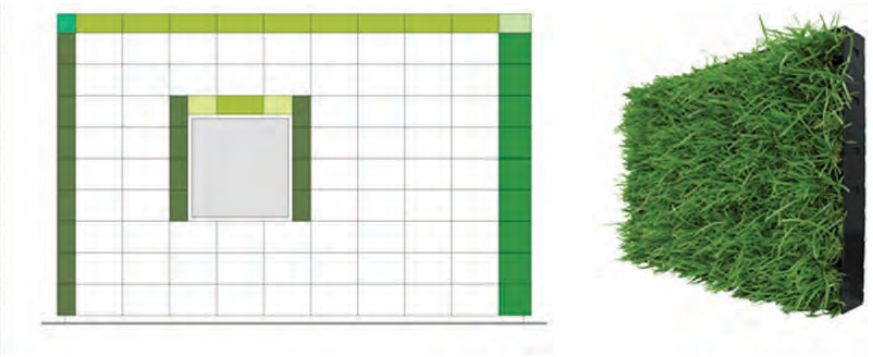


FIG 5.38: EXAMPLE OF A MODULAR SYSTEM (TECOLOGY, 2009:1).

The substrate can be defined as the layer that provides the roots of plants with mechanical support. Various felts and foam-like substances in a series of layers have proved suitable as substrate material. All vertical plantings need to be artificially irrigated. The liquid, containing additional nutrient solutions, is fed in horizontally at regular intervals and sprinkles the substrate by means of a droplet system which ensures an even distribution of moisture by exploiting the force of gravity (Schittich, 2008: 1457).

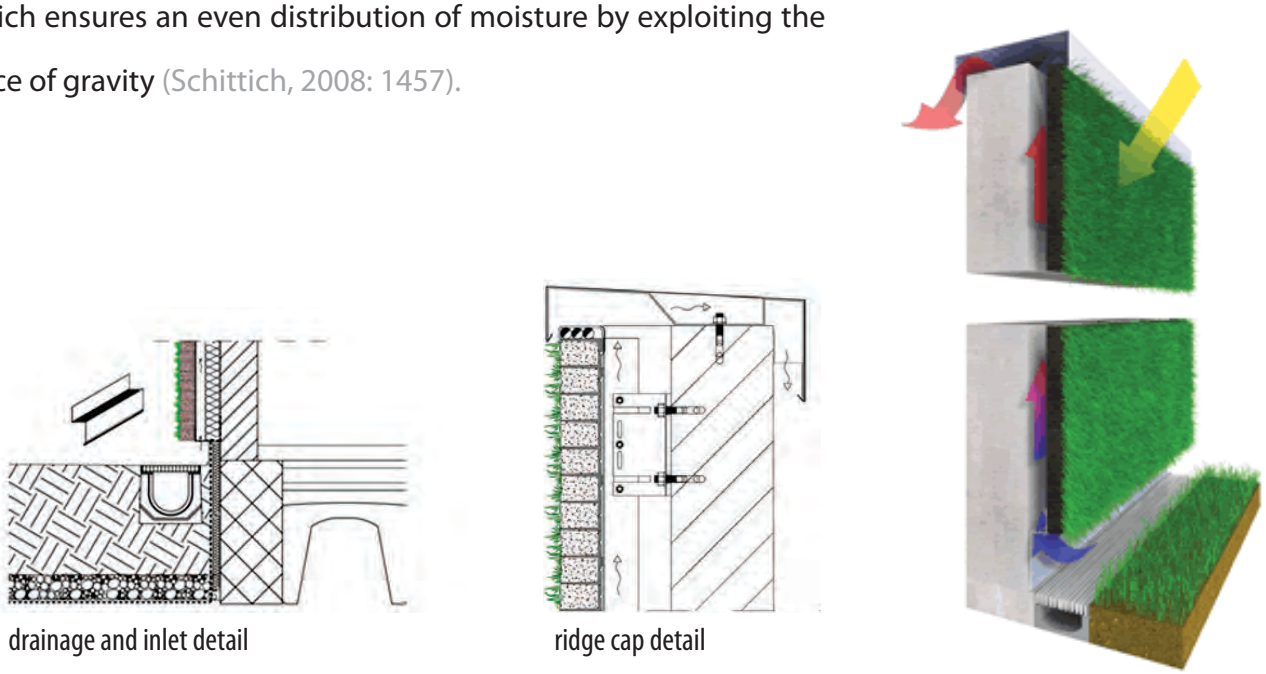


FIG 5.39: SECTIONS - THE WALLS ARE VENTILATED THROUGH A SUITABLY SIZED CAVITY BETWEEN THE STRUCTURE AND CLADDING, IN ORDER TO NOTABLY IMPROVE BIOCLIMATIC CONDITIONS IN THE BUILDING. VENTILATED INLET AT THE FOOT OF THE FACADE MADE OF PERFORATED SHEET METAL AND THE VENTILATED RIDGE CAP CREATE AN EFFICIENT CHIMNEY EFFECT (TECOLOGY, 2009:1).

Internal Green Walls: Green, planted walls are used in internal situations for the positive effect they have on people physiologically and psychologically. This is achieved by using plant life to improve indoor air quality, reduce stress, regulate temperature and diminish noise levels; in order to create a healthy, soothing environment for a building's users. Due to advancements in ecological engineering, the use of vertical planted surfaces for the air conditioning and filtration of internal spaces is fast becoming possible (Callaghan, 2008: 1 & Schittich, 2008: 1464).

FIG 5.40: INTERNAL GREEN-FILTER WALL OF THE UNIVERSITY OF GUELPH-HUMBER, CANADA (SCHITTICH, 2008: 1464)

'Naturaire' is one such system that exploits the properties of plants to filter pollutants from the air and create a hygienic indoor climate free of germs. This 'active' living wall or 'Biofilter' is designed to filter air and provide thermal regulation (Fig 5.40) & (Fig 5.41). It is a hydroponic system fed by nutrient rich water which is re-circulated from a manifold, located at the top of the wall, and collected in a gutter at the bottom of the fabric wall system. Plant roots are sandwiched between two layers of synthetic fabric that support microbes and a dense root mass. These root microbes remove airborne pollutants such as dust, pollen and volatile organic compounds (VOCs) created by carpets, furniture and other building elements, while foliage absorbs carbon monoxide and dioxide. The plants' natural processes produce cool fresh air that is drawn through the system by a fan and then distributed throughout the building. The required size of the Naturaire system is determined by the indoor contaminant load and the cleanliness required for the space. For average residential and office conditions, a ratio of at least 1:100 (area of biofilter to relevant floor area) will achieve the desired effect. In other words, under standard operating conditions, 1m^2 of biofilter will be adequate for a floor area of 100m^2. This system would help improve the internal environmental by creating cool and hygienic internal spaces without the use of chemical filters or air-conditioning (Schittich, 2008: 1464 & Sharp, 2008: 11, 15).

FIG 5.41: DIAGRAM OF 'NATURAIRE' AIR FILTRATION AND THERMAL REGULATION SYSTEM (SHARP, 2008: 11)

Roof Gardens: A more traditional but as effective means of maximising biomass in the built form, is to utilize roof gardens. Traditional rooftops, covered in water proofing membrane, are heat-absorbing surfaces which contribute to the "urban heat island effect", in which city areas become hotter than the surrounding countryside (Fig 5.43). Studies conducted in the US have shown that on a day which is 23ºC, the temperature on a tar roof can rise to a blistering 45ºC, while a green roof will maintain the ambient temperature of 23ºC or less. It has been estimated that if just 20 per cent of the rooftops in Manhattan had green roofs, the temperature of the city could be reduced by two degrees on a summer's day. A report in the BioScience journal estimates that green roofs can reduce air conditioning costs by 25 per cent and electricity by up to 50 per cent. As a result many parts of Germany and the US, have established laws which require new buildings to incorporated green roofing systems (Callaghan, 2008: 2).

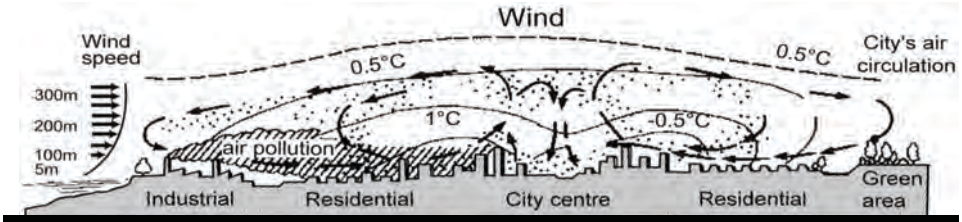


FIG 5.43: HEAT-ISLAND EFFECT IN CITIES (YEANG, 2008: 161).

Green roofs have been around for some time, of course, but they've tended to be restricted to small plants, flower beds and grasses because of their shorter root systems and easier drainage. But with today's advanced filter membranes, waterproof coatings and root barriers, it's now possible to plant bigger trees and shrubs. "Green plumbing" – rooftop water tanks and grey water systems for irrigating plants, powered by solar technology – means rooftop and vertical gardens can now be self-sufficient. There is also the additional benefit of treating the waste water of a building before it is reintroduced to the environment. Botanist, Jim Osborne notes that, *"An average 1000mm annual rainfall is enough to support a self-sufficient rooftop garden."* [This is perfect for Durban as the average annual rainfall is 1009mm] He also notes that, "*Choosing the right plant palettes for the local climate should mean the gardens will thrive with little maintenance."* (Callaghan, 2008: 3).

The California Academy of Sciences, designed by Renzo Piano, is a prime example of a successful roof garden (Fig 5.42). Piano sought to create a natural integration with the park environment, where the building became an extension of the natural surroundings.

FIG 5.42: THE CALIFORNIA ACADEMY OF SCIENCES, DESIGNED BY RENZO PIANO (SAIEH, 2008: 1)

Piano explains his concept, *"With the new Academy, we have created a museum that is visually and functionally linked to its natural surroundings, metaphorically lifting up a piece of the park and putting a building underneath."* (Fig 5.44)(Saieh, 2008: 1).

FIG 5.44: CONCEPTUAL SKETCH OF THE CALIFORNIA ACADEMY OF SCIENCES BY PIANO (SAIEH, 2008: 3).

The roof becomes a one hectare, green landscape with California's indigenous plants, which does not require extra maintenance or artificial irrigation. The native plants will provide habitat for a wide variety of wildlife. This is why the green roof will only have limited access to visitors, who can only walk through a small path. The planted roof provides an efficient thermal insulating layer for the building, reducing energy needs. The undulating roofline draws cool air into the centre of the building, naturally ventilating the interior spaces. Skylights in the roof automatically open and close to vent hot air out through the tops of the domes (Fig 5.45). By absorbing rainwater, the new Academy's living roof will prevent up to 3.6 million gallons of runoff from carrying pollutants into the ecosystem each year (about 98% of all storm water) (Saieh, 2008: 2-6).

The above literature has show some innovative ways of increasing the vegetation or biomass within the built form. It has shown the many benefits of integration, with particular emphasis on creating; an extension to the natural environment, and a healthy environment for the users. This will be relevant to preserving the natural surroundings of the Kings Park Precinct and particularly beneficial to the users of the HPC, both physiologically and psychologically, allowing them to maximise their sporting potential. The green infrastructure would also visually express the healthy ethos of the facility.

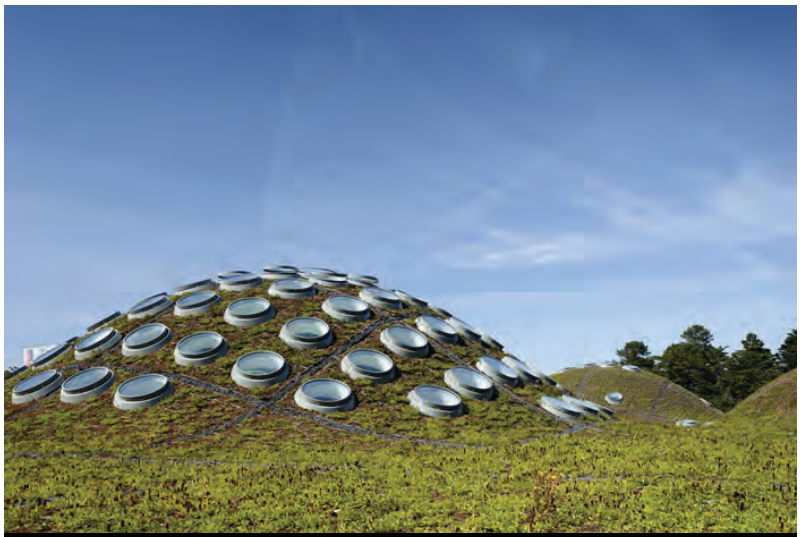


FIG 5.45: THE ONE HECTARE UNDULATING ROOFLINE IMPROVES NATURAL VENTILATION. THE PLANTS ARE INDIGENOUS TO THE REGION (SAIEH, 2008: 1)

5.4.3 ARCHITECTURE AS MEDIA TECHNOLOGY

According to architect Sharon Zukin, the urban landscape is being reshaped by new technologies. Rapid developments in digital screen and projection technology is making it possible for architecture and media technologies to converge into a new kinds of electronic landscape providing architects a multitude of new possibilities (Slaatta, 2006: 1, 10).

The increasing sophistication and digital technologies has made it possible not only to alter dramatically (and temporarily) the atmospheres of places, but also to connect them, live, to other places. This would be particularly important for public spaces such as fan parks (Foster, 2008: 66 & Kronenburg, 2007: 149).

An example of this type of architecture is the Galleria Mall in South Korea, designed by UN Studio. The building is wrapped in a steel frame holding 4,340 glass disks, each of which has an individually controlled LED panel. The entire facade turns into a massive programmable screen showing video, still images and text which can be controlled by the designer over the internet (Fig 5.46) (Kronenburg, 2007: 149).

FIG 5.46: GALLERIA MALL LED FACADE DESIGNED BY UN STUDIO (KRONENBURG, 2007: 149)

Another example of architecture as media technology would be the Xicui entertainment complex in Beijing, near the site of the 2008 Olympics (Fig 5.47). This project utilizes a 'GreenPix - Zero Energy Media Wall' which takes media technology one step further by making the system self sustaining, harvesting solar energy by day and using it to illuminate the screen at night (Fig 5.48).

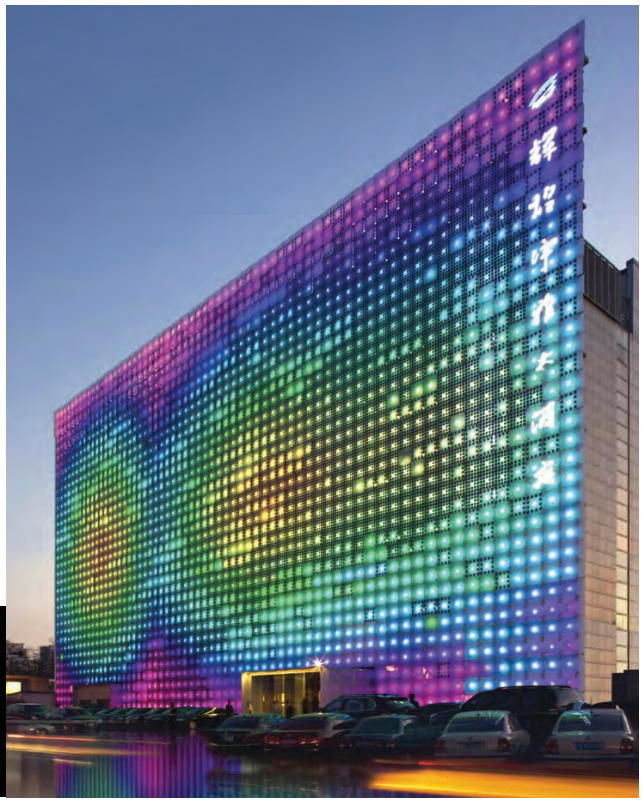
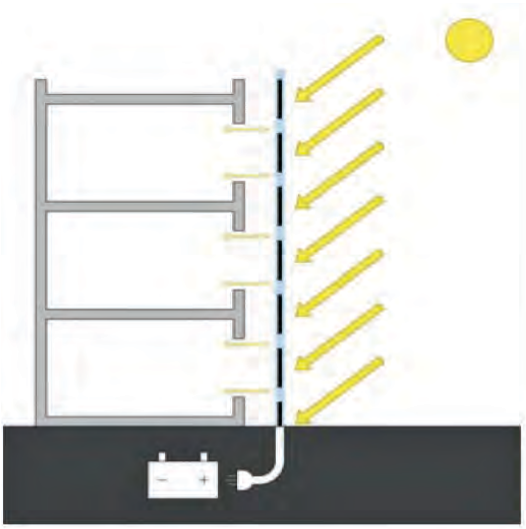
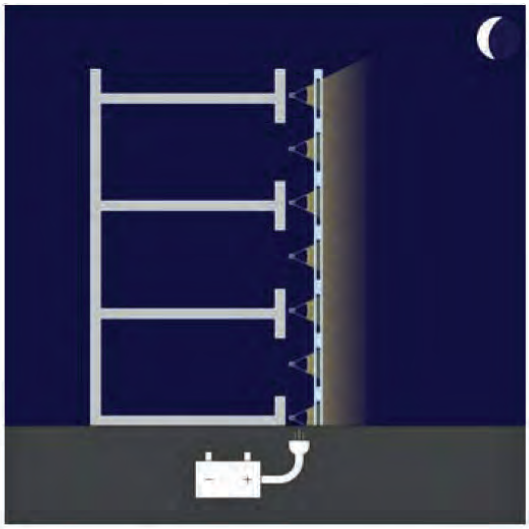


FIG 5.47: THE 'GREENPIX - ZERO ENERGY WALL' OF THE XICUI ENTERTAINMENT COMPLEX IN BEIJING (GIOSTRA, 2008: 3).



Day Cycle: Energy Production.
The photovoltaic solar cells store the solar energy that is not required to the activities in the building during the day, while acting as an affective shading device and protecting the building from excessive heat gain.



Night Cycle: Energy Consumption.
The media envelope releases the energy accumulated during the day, in form of bursting light, transforming the facade in a glowing beacon, and the building in an overwhelming visual experience within the nightscape of Beijing.

FIG 5.48: THE DAY/NIGHT CYCLES OF THE 'GREENPIX - ZERO ENERGY WALL' (GIOSTRA, 2008: 15).

This giant media wall is the largest colour LED display worldwide and the first to integrate a photovoltaic system (Fig 5.49). The Media Wall will provide the city of Beijing with its first venue dedicated to digital media art, in an exciting, innovative and sustainable way(Giostra, 2008: 3).

FIG 5.49: PHOTOVOLTAICS IMBEDED INTO GLASS (GIOSTRA, 2008: 4).

The incorporation of media technology into the architecture of Kings Park would enhance the festive environment of the precinct, by adding to the vibrancy, spectacle and social performance of the surrounding public gathering spaces. This technology would allow for a flexible canvas, adapting to the users, events and surrounding context. It would also become another means of expressing the inner functions of movement and technology within the HPC. This technology would allow people to watch sporting events they cannot afford in a socially integrating atmosphere; even if the game is not taking place locally. It could also be used for concerts, public gatherings, art exhibitions and various other events. This technology would be an economically sustainable solution for the HPC as it would provide advertising real estate for various brands. Companies want to be associated with sport as people associate with the inherent values of fun, health and desire to be the best. The income generated from the advertising could be used for maintenance of the building, outreach programs for talent identification and the sponsorship of developing athlete's education and accommodation.

5.4.4 OTHER RELEVANT TECHNOLOGIES

Other technologies which are relevant to the efficiency of the proposed building typology would be: how to maximise energy use with a heat exchange system and minimize water consumption.

The Macquarie University Sports & Aquatic Centre, by Cox Richardson Architects, demonstrates both these strategies (Fig 5.50).

FIG 5.50: THE MACQUARIE UNIVERSITY SPORTS & AQUATIC CENTRE (COX RICHARDSON ARCHITECTS, 2008: 1)

Heat Exchange: Central to the sustainability initiatives of the facility is the integration of the universities chillers to the pools water heating system (Cox Richardson Architects, 2008: 1). A conventional chiller produces chilled water via a vapour-compression cycle, which is used to cool and dehumidify internal spaces, the by-product of this process is heat which is released in significant quantities to the outdoors via an air-cooled condenser. A Heat recovery system captures this energy, which would otherwise be wasted to the atmosphere, and converts it into useful heat. It does this by using a water-cooled condenser which captures and re-directs the significant amount heat generated to be used to warm the pool water, as well as hot water storage tanks, which supply the shower facilities. The desired temperature for swimming pools is 26°C, which is well within the operating range of heat recovery systems. One of the unique design challenges for this application is protecting the chiller from the corrosive effects of the pool water, which contains high concentrations of chlorine, bromine, and sodium chloride. The use of a corrosion resistant intermediate heat exchanger should therefore be used to overcome this design issue (Fig 5.51) (Carrier Corporation, 2009: 10 & Houlihan, 2003: 277).

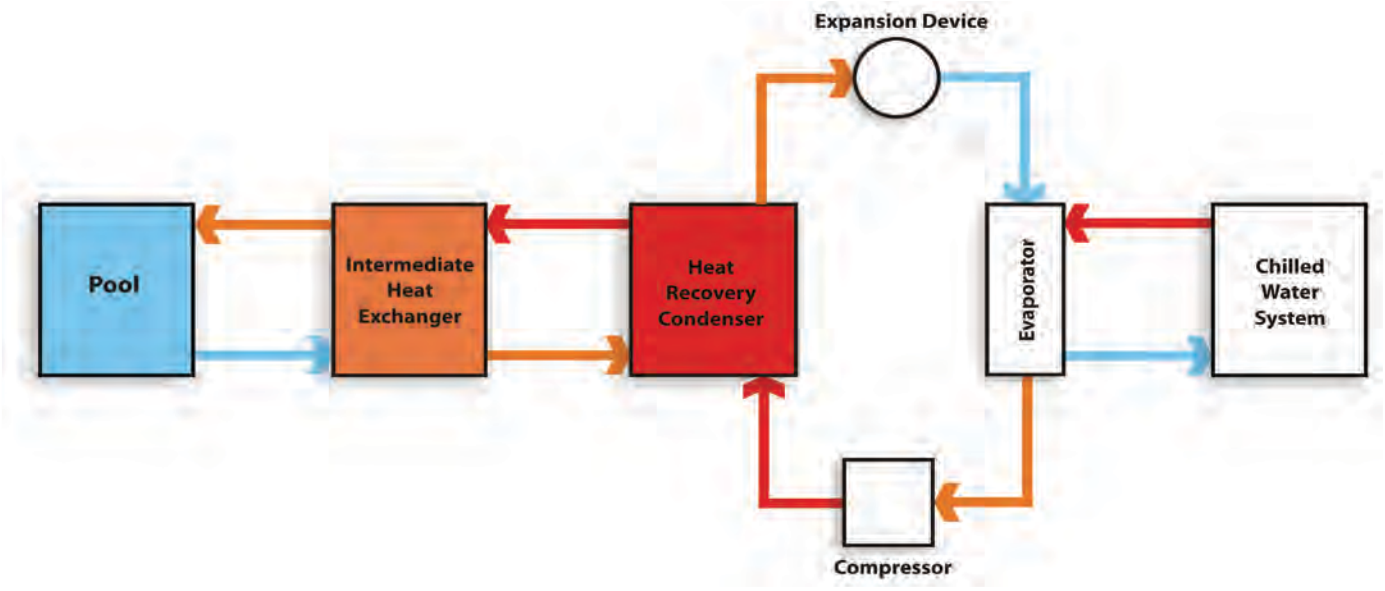


FIG 5.51: DIAGRAM OF HEAT EXCHANGE SYSTEM (INTERPRETED FROM CARRIER CORPORATION, 2009: 10).

What makes this system unique is that the by-product of heat, is recycled, thereby minimising energy loss and improving overall system efficiencies. The moderated water temperature of the pool is used to cool the chillers which make the cooling of internal spaces more economical. Had the water for the showers and pools been heated electrically, without this system, an extra 960 000kwh of energy would have been needed, every year. Therefore it can be seen that a heat exchange strategy reduces running costs and provides significant environmental benefits such as; a reduced reliance on fossil fuels and less heat released to the surrounding environment, thereby reducing a cities heat island affect (Carrier Corporation, 2009: 4-7).

Water Conservation: Other strategies which enhance the environmental performance of the Macquarie University Sports & Aquatic Centre are; strategies such as optimised orientation, shading devices and water conservation strategies. Water is conserved by harvesting rainwater and incorporating a grey water system which uses filtered waste water from the pool, showers and taps which is used for flushing toilets and irrigating surrounding gardens. Waterless urinals and water efficient faucets are also used to minimise water consumption (Cox Richardson Architects, 2008: 1).

Geothermal Heat Exchanger: Another form of heat exchange can be used to regulate the temperature of a building with the energy stored in the earth's surface. Geothermal heat pumps use relatively consistent temperature found in soil or surface water as a heat source or heat sink – instead of using outside air like traditional heat pumps.

The thermal characteristic of the ground minimizes the variation in soil temperature in comparison to the temperature of the air above the ground (Fig 5.52). This helps in shifting the heating or cooling load to the season where it is needed. The earth is warmer than the ambient air in winter and cooler than the ambient air in summer. This continuous yearly cycle, between the air and the soil temperature results in a thermal energy potential that can be harnessed to help heat or cool a building. This system is able to maintain the highest efficiency when heating and cooling interior spaces, with up to 75% energy savings (RETScreen International, 2005: 6).

A ground-source heat pump (GSHP) system has three major components: a heat pump, an earth connection and an interior heating or cooling distribution system (Fig 5.53). The heat pump transfers the heat between the heating/cooling distribution system and the earth connection. It is the basic building block of the GSHP system (RETScreen International, 2005: 4).

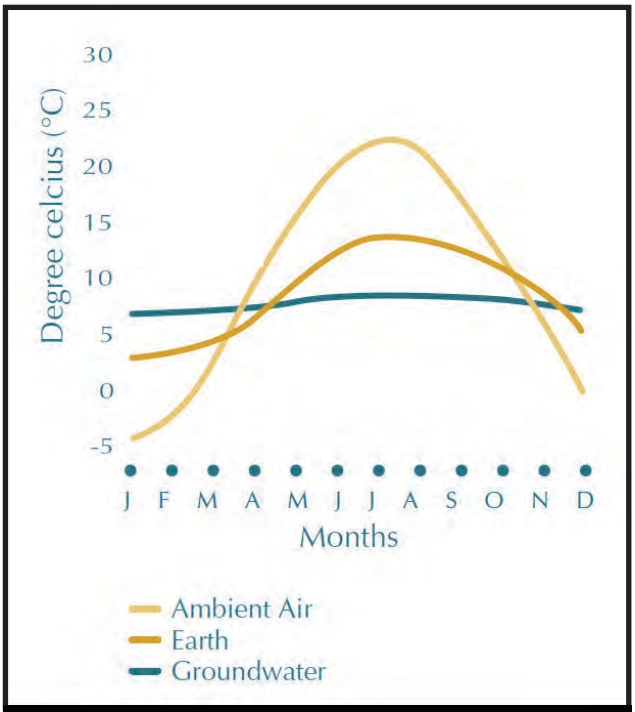


FIG 5.52: TYPICAL AVERAGE MONTHLY TEMPERATURE IN CANADA. THIS TABLE SHOWS HOW THE SOIL AND GROUND WATER TEMPERATURES STAY RELATIVELY CONSTANT, WHEN COMPARED TO THE AMBIENT AIR TEMPERATURE (RETSCREEN INTERNATIONAL, 2005, 6)

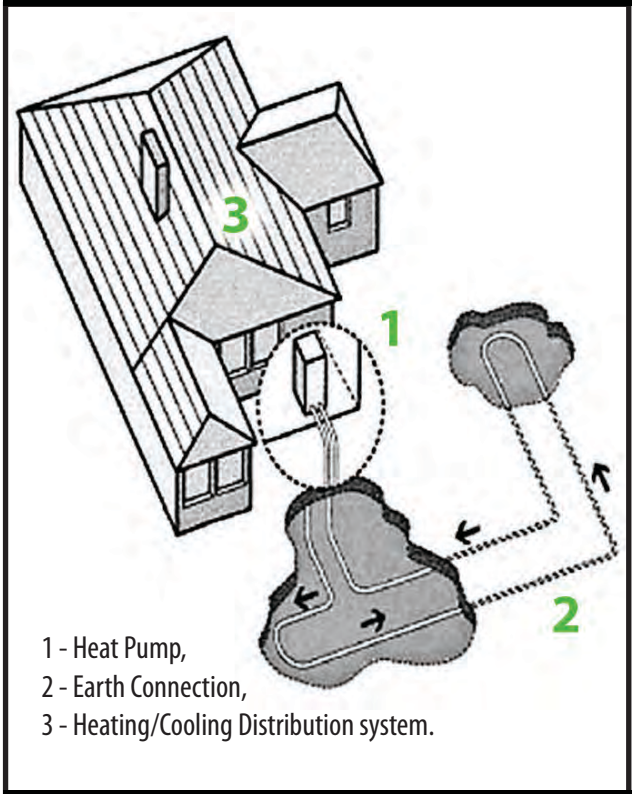


FIG 5.53: DIAGRAM OF THE THREE MAJOR GSHP SYSTEM COMPONENTS (RETSCREEN INTERNATIONAL, 2005, 9)

In winter heat pumps provide heating by extracting heat from the ground and transferring it to the building. In the summer, the process can be reversed so the heat pump extracts heat from the building and transfers it to the ground (Envirotech, 2007: 1).

In theory, heat can be extracted from any source, no matter how cold, but a warmer source allows for higher efficiency. It is difficult to understand how heat extracted from, say, ten degree air can heat anything. This is where the unit's compressor and the "phase change" physical properties of the refrigerant come into play: the compressor boosts the extracted heat to a much higher temperature gas which gives up its heat as it condenses to a liquid in the condensing coil and is distributed to the structure by the air-handling unit (Envirotech, 2007: 1).

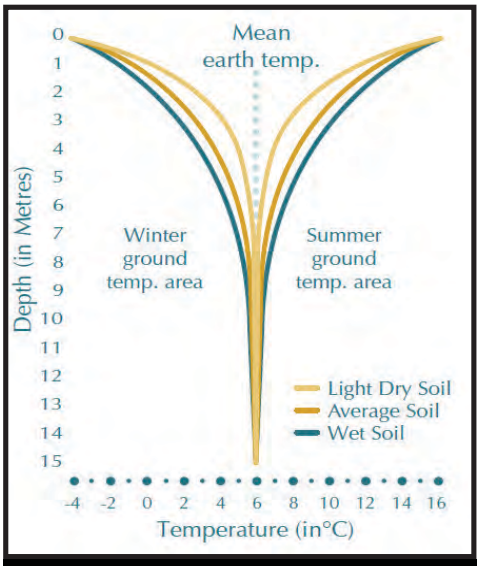
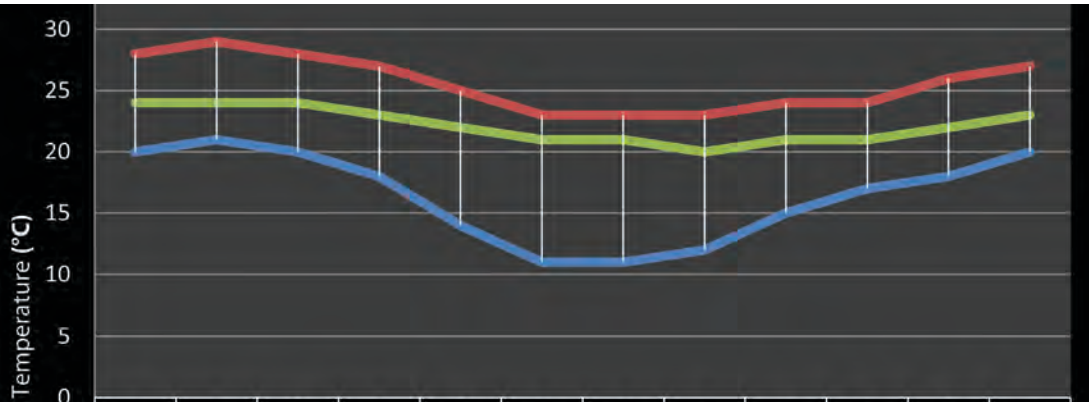


FIG 5.54: TYPICAL SOIL TEMPERATURE VARIATION ACCORDING TO DEPTH. THIS SHOWS THAT FOR A COOLER MORE CONSTANT TEMPERATURE THE EARTH CONNECTION OF THE GSHP SYSTEM MUST BE POSITIONED LOWER UNDER GROUND (RETSCREEN INTERNATIONAL, 2005, 6).

Low water table of the Kings Park precinct could be harnessed to the advantage of the proposed HPC (Fig 5.54) & (Fig 5.55). Water stores tremendous quantities of heat. There is 3472 times more heat stored in a cubic foot of water as in a cubic foot of air, and the heat transfer characteristics of water make it superior to air (Envirotech, 2007: 2).

Conclusion: The technologies/strategies discussed in this precedent will be incorporated into the proposed HPC in order to benefit the users whilst enhancing the environmental performance of the facility.

FIG 5.55: RELATION OF DURBAN'S AIR TEMPERATURE TO SEA TEMPERATURE OVER THE YEAR (CLIMATETEMP, 2009: 1).



	J	F	M	A	M	J	J	A	S	O	N	D
Average High Air Temp	28	29	28	27	25	23	23	23	24	24	26	27
Average Low Air Temp	20	21	20	18	14	11	11	12	15	17	18	20
Average Sea Temp	24	24	24	23	22	21	21	20	21	21	22	23

5.5 EXTENSION OF THE NATURAL ENVIRONMENT, SOCIAL INTEGRATION AND SPATIAL RELATIONSHIPS.

5.5.1 MERCATOR SPORTS PLAZA

Introduction:

Much of the information gathered for this precedent has been gleaned from a personal visit to the facility on the 2nd of July 2009. Other information has been sourced through relevant literature. The Mercator Sports Plaza is located

Extension of the Natural Environment:

The brief of the Mercator Sports Plaza called for the conversion of an open air swimming pool into a multifunctional leisure complex. The project is located in a park within Amsterdam and was completed in July 2006. This was met with opposition from local residents, who feared a loss of green space. The architects of Venhoeven CS came up with a radical design for a 7100m^2 building almost entirely concealed in a green hill. This would create an extension to the natural environment in which the The facility and park merge together, maintaining the natural greenery of the area. Not only are the roofs planted, so too are the facades which resemble green embankments (Fig 5.56) & (Fig 5.57) (Schittich, 2007: 828).

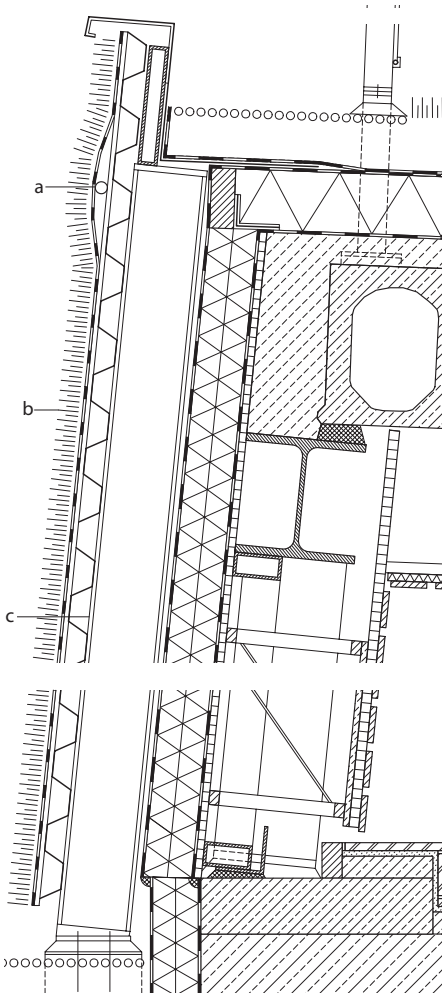
FIG 5.56: PARK ELEVATION OF THE MERCATOR SPORTS PLAZA (SCHITTICH, 2007: 829)

FIG 5.57: STREET ELEVATION AND ENTRANCE TO THE FACILITY.

The green façade is made with the patented 'Wonderwall' system by Copijn. This system incorporates a growing layer consisting of a metal substructure, plastic membrane and a felt fleece which has small pockets for plant growth. Integrated within the growing wall are automatically regulated systems and sensors for irrigation and nutrition (Fig 5.58) & (Fig 5.59) (Affleck, 2008: 81).

The Dutch climate ,the vertical position of the Wonderwall and the orientation of the differing parts of the building, with their varying exposures to sun and wind, create very specific biospheres. Thus in order to guarantee lush vegetation on all elevations under such diverse circumstances, a specific assortment of plants was chosen for each orientation, and carefully arranged in grouped patterns to create a wild and varied camouflage. Both the roof and elevations are covered with over 50 different species of indigenous plant (Fig 5.60). Over the years this external envelope will develop into wild and lush vegetation, whilst altering the appearance of the building from season to season (Affleck, 2008: 81).

FIG 5.59: THREE DIMENSIONAL SECTION THROUGH THE FACADE OF THE FACILITY (LEER, 2008: 68).



a - hose for irrigation
b - green facade planting:
10mm felt mat. 10mm plastic panel. metal sheeting 50mm deep.
c - 180mm steel A-stection

FIG 5.58: FACADE DETAIL OF 'WONDERWALL' SYSTEM (SCHITTICH, 2008: 1459).

FIG 5.60: THE BUILDING IS COVERED BY OVER 50 DIFFERENT SPECIES OF INDIGENOUS PLANTS.

Social Integration:

The Mercator Sports Plaza has been conceived as a large Grotto: a collective space to stimulate public participation and the communication between diverse user groups. It becomes not only a swimming pool complex, but strives to be a communal activity centre and public meeting point for the 129 different nationalities of the Amsterdam neighbourhood of De Baarsjes (Leer, 2008: 69-71).

This landscaped pool-complex is equipped with several indoor and outdoor swimming pools, a restaurant, cafe and fast food restaurant, on the ground floor (Fig 5.61). The accommodation of the upper floors is composed of a fitness centre, sauna, sun studio, nursery, open air terrace, meeting rooms and an event/party hall (Fig 5.62) (Leer, 2008: 71).

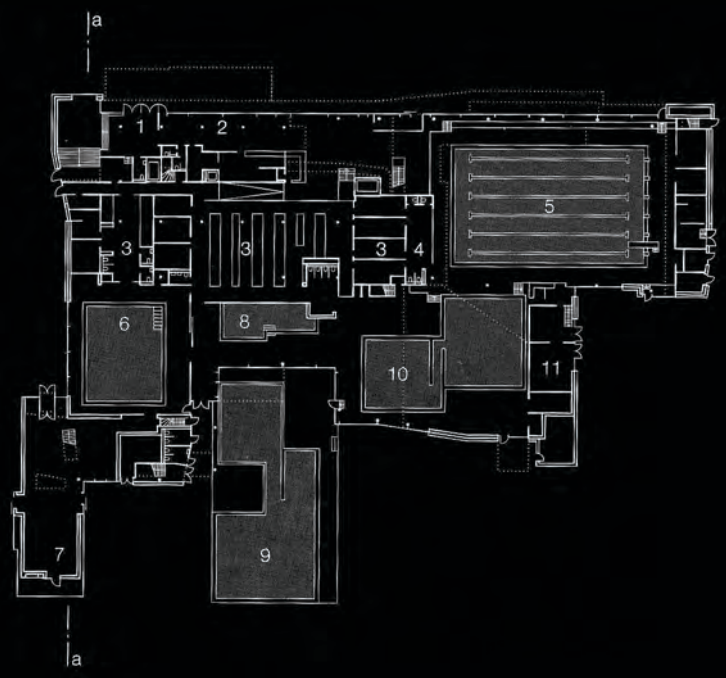


FIG 5.61: GROUND FLOOR, SCALE 1:1000 (SCHITTICH, 2007: 828)

1 Entrance hall
2 Restaurant
3 Changing cabins
4 Showers
5 Competition pool
6 Treatment pool
7 Fast-food restaurant
8 Toddlers' pool
9 Play pool
10 Teaching pool
11 Technical systems
12 Administration
13 Kitchen
14 Solarium, steam bath
15 Void
16 Fitness equipment
17 Events hall
18 Patio
19 Roof terrace

FIG 5.62: FIRST FLOOR, SCALE 1:1000 (SCHITTICH, 2007: 828)

FIG 5.63: SECTION A-A, SCALE 1:1000 (SCHITTICH, 2007: 829)

Spatial Relationships:

The mixed-use nature of the facility creates a vibrant atmosphere which is enhanced by the visual interconnections between the various activities. These visual interconnections are created both vertically and horizontally through interconnecting voids/volumes and clear glazing. (Fig 5.64), (Fig 5.65) & (Fig 5.66).

A generous entry is established for the complex with the provision of café facilities which address both the street and the foyer. Another interesting spatial relationship is that the fitness centre utilizes the open air terrace for many of the health a wellness classes (Fig 5.67).

Conclusion:

The Mercator Sports Plaza has demonstrated interesting principles for; creating extensions to the natural environment, promoting social integration and enhanced spatial relationships. These principles will be utilized in the proposed HPC for the Kings Park Precinct.

FIG 5.64: VISUAL LINK BETWEEN FITNESS CENTRE AND POOLS

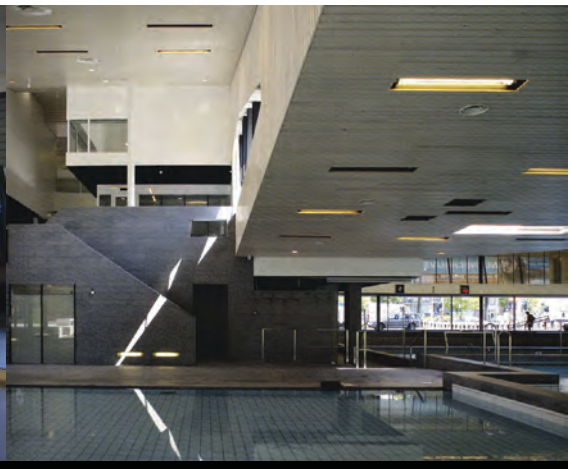


FIG 5.65: VISUAL INTERCONNECTIONS

FIG 5.66: VISUAL CONNECTION BETWEEN POOLS AND ENTRANCE FOYER.

FIG 5.67: OPEN AIR TERRACE IS USED FOR MANY HEALTH AND WELLNESS PROGRAMS.

5.6 CHAPTER 5 SUMMARY:

This chapter has explored precedents which have responded to theories of the previous chapter, whilst revealing overlapping secondary issues which are relevant to the research.

The study started by investigating how a sports event can be used to revitalise an area of 'lost space'; which benefits the people of the region on a daily basis, long after an event has ended. The analysis revealed principles of generating a well used sustainable urban framework for the Kings Park Precinct. It investigated new technologies, concepts and theories in order to create an environmentally sustainable intervention in which the buildings 'performance' between user and surrounding context becomes a generator for the architecture. This was done in order to create, a more meaningful architecture which expresses the 'DNA' of the building while relating to the users and surrounding environment.

The precedents will be used to inform a brief and ultimately the design of a High Performance Facility for Durban. The case studies of the next chapter will continue this pursuit, gaining valuable insight into the functional requirements of the proposed HPC.

6 CASE STUDIES

Chapter 4 moved away from the purely theoretical and began dealing with the practical issues of architecture, this chapter takes that move further and analyses local examples of architecture which cater to high performance sports.

It would be hard to determine the actual "success" of any building if one relies solely on literature. Thus the analyses of case studies are undertaken first hand, with dimensioned drawings, photographs and a critical evaluation of the buildings. This will be done in order to provide more insight to the proposed HPC and its functions, as it is visited on a personal level where users of the facility can be interviewed about their thoughts on the facility and the building experienced for oneself.

Issues to be determined include; space and volumetric requirements, spatial relationships, processes and functions of the buildings, required facilities and technologies, appropriate site selection and other issues. It will reveal how architects have dealt with issues of architectural expression, integration into the urban fabric and response to socio-economic and environmental circumstances. The analysis will identify both the positive and negative aspects of each case study; providing valuable lessons which can be applied to the design proposal.

Ultimately this chapter becomes an important guide/reference to the proposal; helping to inform a schedule of accommodation and brief for a Durban based HPC. The case studies include:

6.1 THE SPORTS SCIENCE INSTITUTE OF SOUTH AFRICA

6.2 THE TUKS HIGH PERFORMANCE CENTRE

6.1 THE SPORTS SCIENCE INSTITUTE OF SOUTH AFRICA

Project Details:

Architects: MLH Architects

Client: Sports Science Institute of South Africa / University of Cape Town

Primary Functions: Services, Research and Teaching related to sports

Project Area: 11,700sqm Total Area & 9,400sqm excluding the offices of the WPRFU

Project Location: Newlands, Cape Town, South Africa

Completion: 1994

Introduction:

The information presented in this case study has been gleaned from, a personal visit to the Sport Science Institute of South Africa (SSISA) and an interview with Prof. Tim Noakes on December, 12, 2008, unless otherwise stated.

The SSISA (Fig 6.1) was conceived after South Africa's dismal performance at the 1992 Barcelona Olympics. Compared to a country with a similar population size, Australia won 27 medals compared to South Africa's 2 medals, none of which were gold. Australia's success was attributed the implementation of the Australian Institute of sport in 1981 (Cooke, 1997: 24).

FIG 6.1: THE SPORTS SCIENCE INSTITUTE OF SOUTH AFRICA (COOKE, 1997: 24).

The SSISA was developed by Prof. Tim Noakes of the UCT Exercise and Sports Sciences Department and Morne Du Plessis (former Springbok captain), CEO of the Institute (Robertson, 1995: 9). The funding for the project was supported by major South African corporations such as Discovery health, Woolworths and New Balance.

Prof. Noakes explains that, "The Sports Science Institute exists to optimise the sporting performance and health of all South Africans through the execution, applicati*on and dissemination of science*". Morne Du Plessis notes that, "The institute is inclusive, not exclusive and is based on the premise that we can build a healthy nation through physical activity and create unity through the development of sporting excellence." (Noakes, 2004: 1)

The Institute offers a multi-disciplinary range of services that cater for a wide variety of needs; from health and wellness to sporting excellence, using exercise, nutrition, scientific analysis and mental health to enhance human performance. The Institute has a diverse spectrum of users; both able bodied and disabled users of all ages. Users of the facility include:

- Professional athletes of national, provincial, club and school structure.
- Sports people who want to improve their performance times (in the case of runners, cyclists and swimmers) or their score (in the case of teams, other individual sports) through improved fitness and technique.
- The general public aiming to improve their health, fitness and wellbeing.
- Patients requiring rehabilitation or prevention of sporting injuries.
- Students and lecturers of the tertiary education component.
- Coaches in training and practicing coaches.
- Developing Talent: The SSISA has a variety of sponsored talent identification and outreach programmes; providing an environment wherein young, talented, financially disadvantaged athletes receive guidance towards reaching their greatest potential.
- Other users may include the general public using the SA Rugby Museum and conference/ auditorium facilities.

The Site:

The SSISA is situated in the Newlands Sport Precinct, Cape Town (Fig 6.10). The site was originally a practice field for the Newlands rugby stadium but railway developments rendered the field too small for rugby. For this reason the Sport Science Institute was granted a lease from the Western Province Rugby Football Union (WPRFU) for 99 years (Robertson, 1995: 11). One of the main criteria for the selection of the site was for the facility to be located in an established sports precinct which makes use of existing infrastructure and facilities; thereby creating a symbiotic relationship between similar functions or interests. The site was therefore situated next to both the regional provincial rugby and cricket grounds, whilst still within walking distance of the Newlands swimming pool. Due to the above mentioned points and the fact that the site has excellent access to public transport, the site is an ideal choice for the institute (Robertson, 1995: 5).

Design:

All the plans and a section through the facility are bundled together at the end of this section (Fig 6.11) - (Fig 6.17).

There were no previous local precedents of this building typology in South Africa, therefore institutions in the US, Canada and Australia were studied; this was followed by user group workshops to develop the brief.

The design of the SSISA used four major guiding principles (Cooke, 1997: 25):

1. Separate high-activity areas allocated for semi-public and common usage (Southern Block) from more private offices, research and teaching areas (Northern Block).
2. The high activity areas required; natural lighting and large spans for uninterrupted open spaces.
3. Provide sufficient site parking.
4. Recognise the many site constraints

The massing of the building has been designed as two entities (the Northern and Southern Block) connected by a central double-volume atrium space (Fig 6.2). This massing attempts to respond to its context, by addressing the adjacent built forms on the site. The larger of the two entities is the six storey northern block which responds in height to the neighbouring 26m high Newlands stadium. The lower southern block steps down in scale to two stories and responds to the single storey terrace of Victorian cottages in the south (Fig 6.3).

FIG 6.2: THE CENTRAL ATRIUM SEPATARATES THE SIX STORY NORTHERN BLOCK FROM THE TWO STORY SOUTHERN BLOCK (ROBERTSON, 1995: 11).

The initial footprint and height of the building was determined largely by the need to accommodate 280 parking's on site. 44 of these are covered parking bays located on the ground floor of the North block below the multipurpose sports hall. The parking was also designed to allow for the ability to park media trucks for major sporting events. Most parking is on the western side of the building, which has been planted with trees to soften the hard landscape and to provide shade. This edge also serves as the entrance and front façade of the building. The entrance is partially successful in relating to the street as this is hampered by palisade fencing which acts as a physical barrier and partial visual barrier.

FIG 6.3: THE MASSING OF THE INSTITUTE RESPONDS TO ITS CONTEXT (ROBERTSON, 1995: 10).

The spaces of the institute were separated into Public, Semi-Public and Private Areas. The central atrium forms the public space, the 2 story southern block forms the majority of semi-public space and the 6 story northern block is comprised mainly of private spaces.

Central Atrium: Public spaces are limited to the ground floor double volume atrium which serves as an entrance and link between the 6 storey North block and the 2 storey South block. This space serves as a foyer and spill over space for auditorium functions which have access to the kitchenette/juice bar. This central space becomes a movement spine and orientation device, allowing legibility of internal functions.

FIG 6.4: THE SOUTH FACING CLEARSTORY WINDOW OF THE CENTRAL ATRIUM MAXIMIZES NATURAL DIFFUSED LIGHT.

The central atrium allows for natural diffused light to penetrate deep into the two blocks. This is due to the large south facing clearstory windows which also allow for efficient natural ventilation (Fig 6.4).

Southern Block: The southern block is primarily comprised of large span, semi-public spaces with the exception of the orthopaedics wing. The semi-public spaces include a 160 seater, state of the art auditorium with smaller lecture room, a gymnasium, a 6 lane 25m swimming pool and an indoor running track (Cooke, 1997: 26). These facilities are shared by the athletes and general public. This relationship has been particularly successful, according to Prof. Noakes, as people get to see and are inspired by the various professional athletes in action. The high activity spaces have an abundance of natural light due to clearstory lighting, perimeter glazing, open planning and large volumes. According to professor Tim Noakes, the gym is an important part of the economic sustainability of the facility.

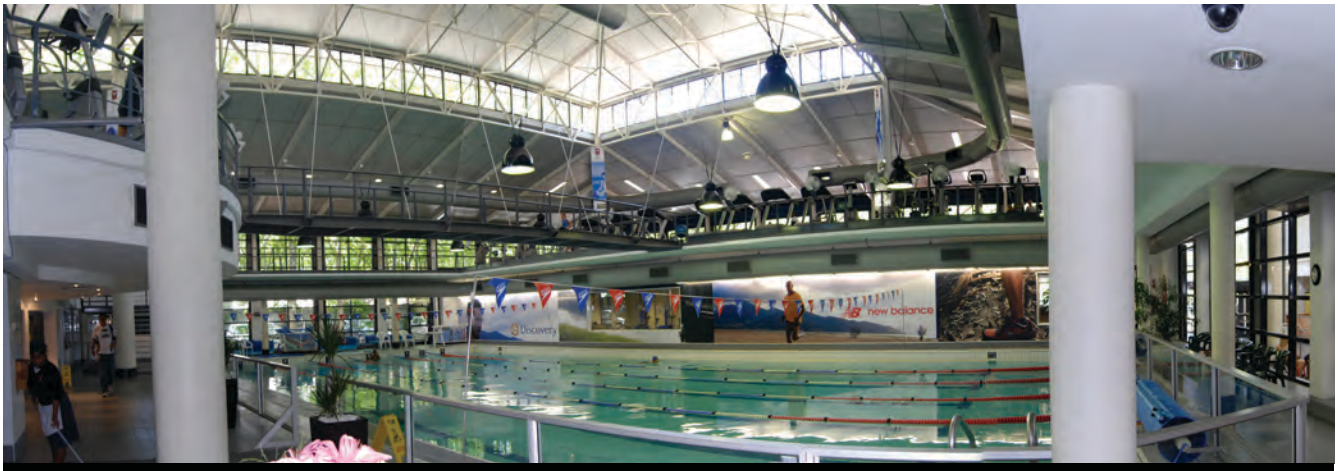


FIG 6.5: THE GYMNASIUM AND 25 METER POOL OF THE SOUTHERN BLOCK.

The two sections of the gymnasium on the first floor are linked by a steel bridge over the swimming pool. The bridge allows for the observation and filming of swimmers for such things as 'stroke correction' (Fig 6.6). The pool edge features a special rim-flow design to counteract the wave effect generated by swimmers (Robertson, 1995: 13).

The ground floor auditorium is partially subterranean which makes use of sandwich construction in the sloping floor to dampen vibration and noise caused by the neighbouring railway line (Lienenberg & Stander, 1995: 15).

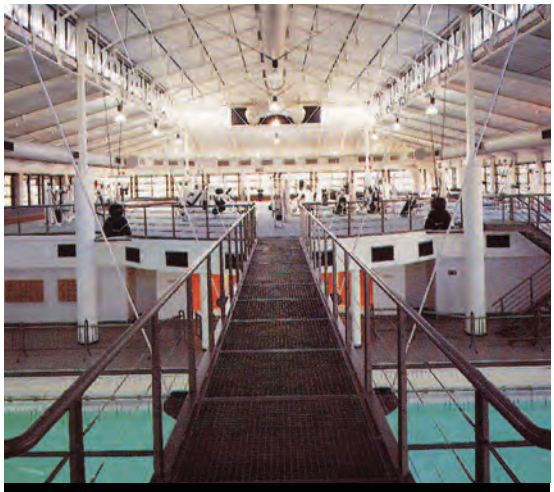


FIG 6.6: BRIDGE USED TO LINK THE TWO AREAS OF THE GYMNASIUM ON THE FIRST FLOOR WHILST ALLOWING FOR THE OBSERVATION OF SWIMMERS' TECHNIQUE (ROBERTSON, 1995: 12).

Northern Block: The 6 story Northern block is mostly comprised of private spaces with the exception of the SA Rugby Museum. The structure of this block is predominantly composed of relatively short spans of 6.5m, with the exception of the 19m spans of the multipurpose sports hall. This block contains the primary vertical circulation core, in the form of two lifts and a staircase off the lift lobby.

The ground floor of this block accommodates a kitchenette and server, reception and administration offices, covered parking, services, changing rooms for the sports hall on the storey above, and the SA Rugby Museum.

Most of the service provider (non-university) functions are on the 1st floor of the Northern Block and form the sports medicine component. These services cater for the treatment of sports injuries and rehabilitation; which include physiotherapy, bio-kinetics, a sports vision centre, nutritionists and sports psychologists as well as a cardiac rehabilitation and weight-loss centre. According to Prof. Noakes, these services also help with the economic sustainability of the facility.

Also accommodated on this level is a double volume multipurpose sports hall which is positioned in the central space of the northern block (Fig 6.7). The hall is large enough for playing tennis but is mainly used by the biomechanics laboratory, cardiac rehabilitation and weight-loss centre for analysing athletes in action and general exercise. Roof lights above the sports hall allow natural light to penetrate deep into the space, whilst the activities of this area provide an active and vibrant atmosphere to the 1st and 2nd floors.

FIG 6.7: THE MULTIPURPOSE SPORTS HALL OF THE NORTHERN BLOCK.

An external 40m elevated track makes it possible for athletes to run into the sports hall at maximum sprint speed so that their movements can be filmed and measured electronically with force plates embedded in the surface of the track.

FIG 6.8: THE 40 METER SPRINT TRACK ENTERS THE MULTIPURPOSE HALL ON THE FIRST FLOOR (COOKE, 1997: 24).

The 2nd and 3rd Floors of the North Block form a satellite campus to the University of Cape Town (UCT); providing both research and teaching facilities for the Exercise Science and Sports Medicine Department. The UCT component researches factors influencing physical performance and health while disseminating knowledge and skills through education. Facilities include; a biomechanics laboratory (analysing athletes in action through film and electronic measuring), biochemistry and bicycle/treadmill laboratories, UCT staff offices and student spaces, audio visual analysis rooms (for analysing footage of athletes and game strategies), a radiology department and ancillary spaces. In addition, experiments are undertaken in an environmental chamber in which athletes are subjected to simulated climatic conditions and where the effects of temperature, humidity and wind on their performance can be analyzed. A metabolic chamber is used for recording physiological reactions of athletes over a number of days.

The primary aims of a scientifically based exercise testing and medical evaluation programmes are:

- To determine the physiological and health status of an athlete
- To indicate the athlete's strengths and weaknesses relevant to his/her sport
- To provide baseline data for training prescription
- To provide insight into the condition of the athlete and the type of changes that might be feasible to optimize performance.

The spaces on the 2nd floor are connected by a gallery corridor overlooking the sports hall, while a direct link to the hall is provided by a steel staircase. The community health and outreach programmes are run from two dedicated offices on the 3rd floor.

The 4th and 5th floors of the northern block are reserved for the offices of the Western Province Rugby Football Union (WPRFU) as it was a condition to the lease of their land.

Other Observations:

The multi-disciplinary team of health professionals' work together to provide a variety of services that are interlinked to offer a comprehensive service to the athlete and coach. Prof. Noakes stresses that, "There needs to be a high-quality academic environment which forms a critical mass of intellectuals, sharing knowledge and expertise." He also notes that, "There is a definite need for such a facility in Durban."

From an urban design perspective, the building responds fairly well to Sport Pienaar Road. With the development of the Institute, the street paving and landscaping of Sport Pienaar Road was continued to from a landscaped parking area which on match days transforms into a pedestrian precinct and market place, aptly named 'Rugby Square', incorporating food and souvenir stalls (Fig 6.9). The building however does not engage with or add much to the public realm other than defining space. It was suggested by Prof. Noakes, that the facility would benefit by being near an athletic facility to make use of infrastructure and equipment such as the track, which would eliminate the need for the 40m sprint track.

FIG 6.9: THE PARKING AREA OF THE SSISA BECOMES A PUBLIC SQUARE ON MATCH DAYS (ROBERTSON, 1995: 11).

Direct sunlight is avoided while maximising natural light due to appropriate massing, orientation, shading devices and deeply set windows.

The building was designed to be fully accessible to the disabled. Unisex toilets are provided at each level and there is a dedicated change room for the disabled using the swimming pool, sports hall and gymnasium. Changes in level are supplemented with appropriate ramps while the upper and lower levels of the auditorium are accessible by wheel chairs to accommodate both lecturer and audience. The gymnasium can be accessed by wheelchair users via the lifts in the northern block which links to the gymnasium in the southern block via a steel bridge. This bridge also provides direct access between the sports science/medicine component and gymnasium.

Unlike the case study of the TUKS HPC, accommodation is not provided on site. Accommodation is within walking distance of the institute but it was noted by Prof. Noakes that it would be beneficial to have accommodation on site. This would provide convenience for athletes and coaches while creating a safe environment with 24 hour activity. It was also noted that it would be beneficial to have; an AV room for group viewings/discussions and a sports hall which could accommodate more sports, or a variety of sports simultaneously.

Conclusion

This case study has provided invaluable information into this building typology. It has revealed the potential user groups, site selection criteria, space and volumetric requirements, spatial relationships, processes and functions of the buildings, and required facilities and technologies. It highlighted the need for efficient paraplegic access and a privacy gradient. A need for onsite accommodation and the integration of a tertiary education component was established.

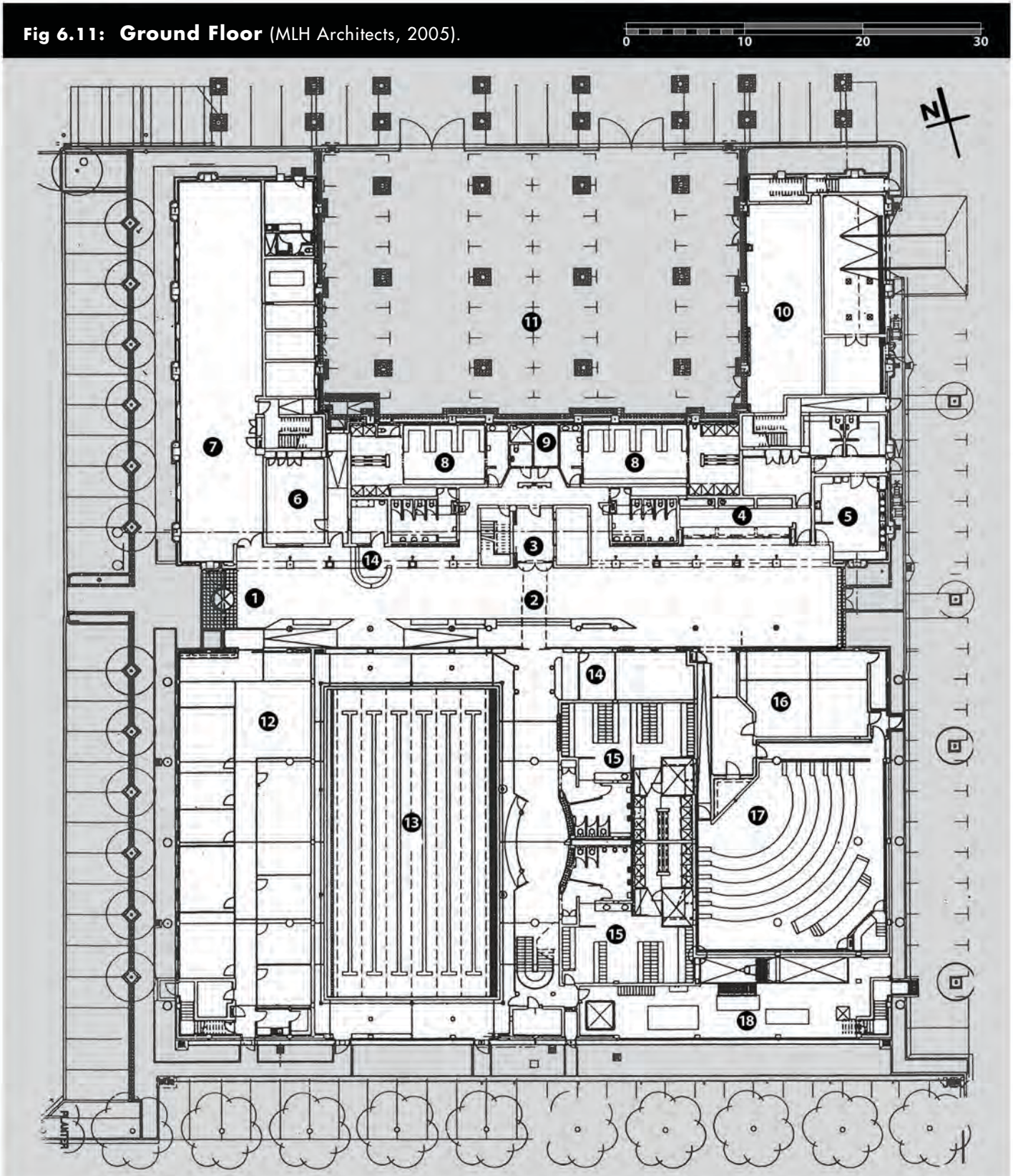
Although the built form has attempted to respond to the surrounding environment from an urban and environmental perspective; other strategies ought to have been sought to improve the relationship between the public space and built form. Strategies to improve the environmental frugality of the building and create a healthy environment for the users should to be treated as a primary objective.

The information gleaned from this case study, as well as the interview with Prof. Tim Noakes will be used to inform an appropriate brief and schedule of accommodation for the proposed HPC for Kings Park, Durban.

Fig 6.10: SSISA Urban context
Newlands Sport Precinct

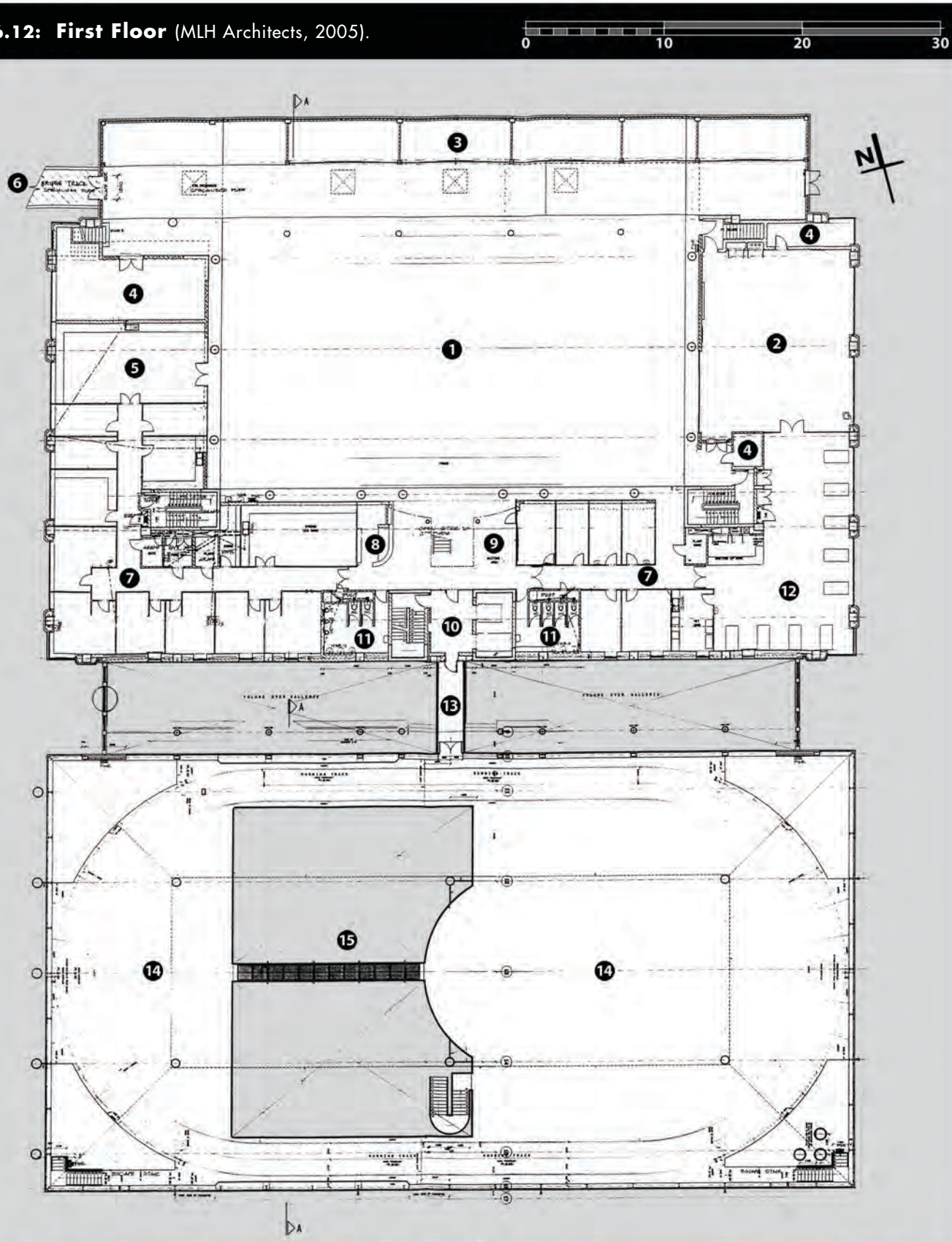
1. Sport Science Institute of South Africa;
2. Newlands Rugby Stadium;
3. Newlands Cricket Stadium;
4. Newlands Swimming Pool;
5. Public Transport Node;
6. Kelvin Grove Club (Tennis, Bowls, Gym, Squash, Cricket and Rugby).

Fig 6.11: Ground Floor (MLH Architects, 2005).



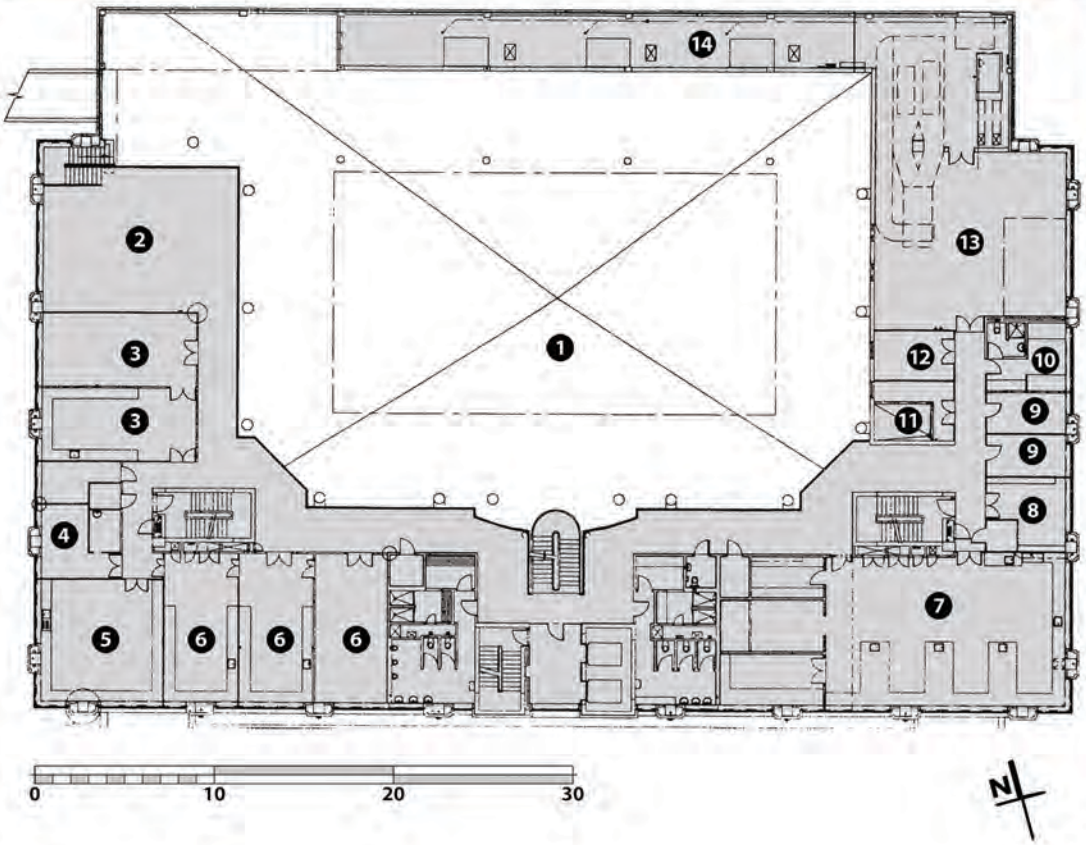
1. Entrance;
2. Gallery/Atrium;
3. Lift lobby;
4. Juice bar;
5. Kitchen;
6. Building management;
7. SA Rugby Museum;
8. Change room for sports hall;
9. Disabled change room;
10. Plant/service room;
11. Under cover parking;
12. Orthopaedics wing;
13. Swimming pool;
14. Reception/offices;
15. Change room for Pool/Gym;
16. Lecture room;
17. Auditorium;
18. Plant room.

Fig 6.12: First Floor (MLH Architects, 2005).



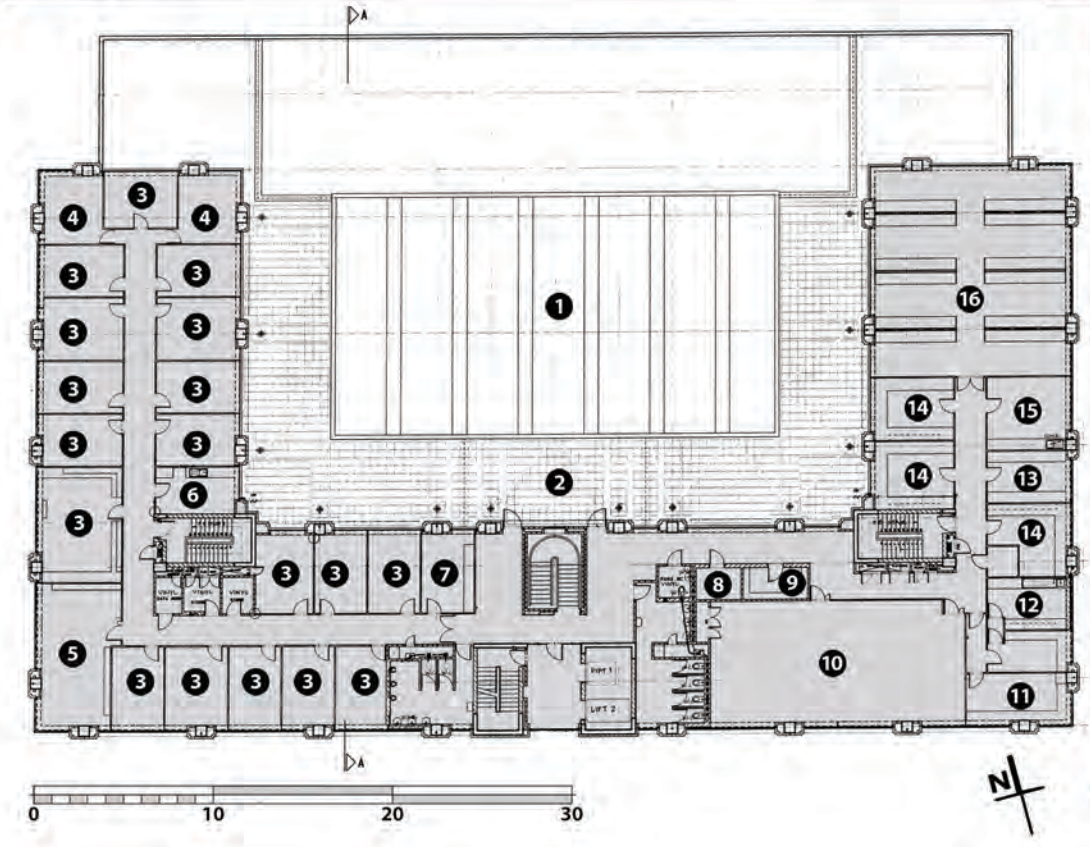
1. Sports Hall;
2. Rehabilitation gym;
3. Storage converted to consultation rooms;
4. Storage room;
5. Athletics testing;
6. Elevated sprint track;
7. Sports Medicine component;
8. Reception;
9. Waiting area;
10. Lift lobby;
11. Restroom;
12. Physiotherapy room;
13. Steel connecting bridge;
14. Gymnasium with perimeter running track;
15. Steel bridge over pool.

Fig 6.13: Second Floor (MLH Architects, 2005).



1. Double volume over sports hall;
2. Biomechanics laboratory;
3. Treadmill laboratory;
4. Sterile room;
5. Muscle function room;
6. Bicycle laboratory;
7. Biochemistry laboratory;
8. Store room;
9. AV analysis room;
10. Bedroom suite;
11. Hydrodensitometry;
12. Workshop;
13. Metabolic and environmental chambers;
14. A/C plant room.

Fig 6.14: Third Floor (MLH Architects, 2005).



1. Roof light over sports hall;
2. Roof Terrace;
3. UCT staff office;
4. Community outreach office;
5. Staff room;
6. Kitchenette;
7. Reception/ secretery;
8. A/C plant;
9. Store room;
10. Classroom (60 persons);
11. Graphics room;
12. Dark room;
13. Printing room;
14. Computer LAN;
15. Student lounge;
16. Classroom (24 persons).

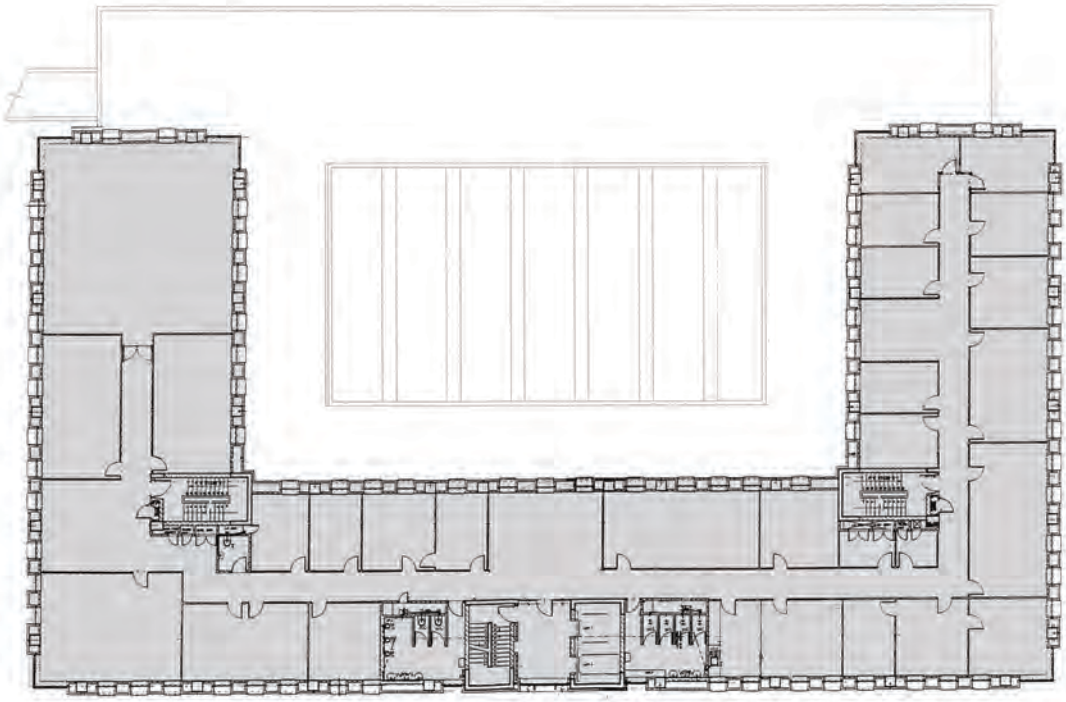


Fig 6.15: Fourth Floor (MLH Architects, 2005).

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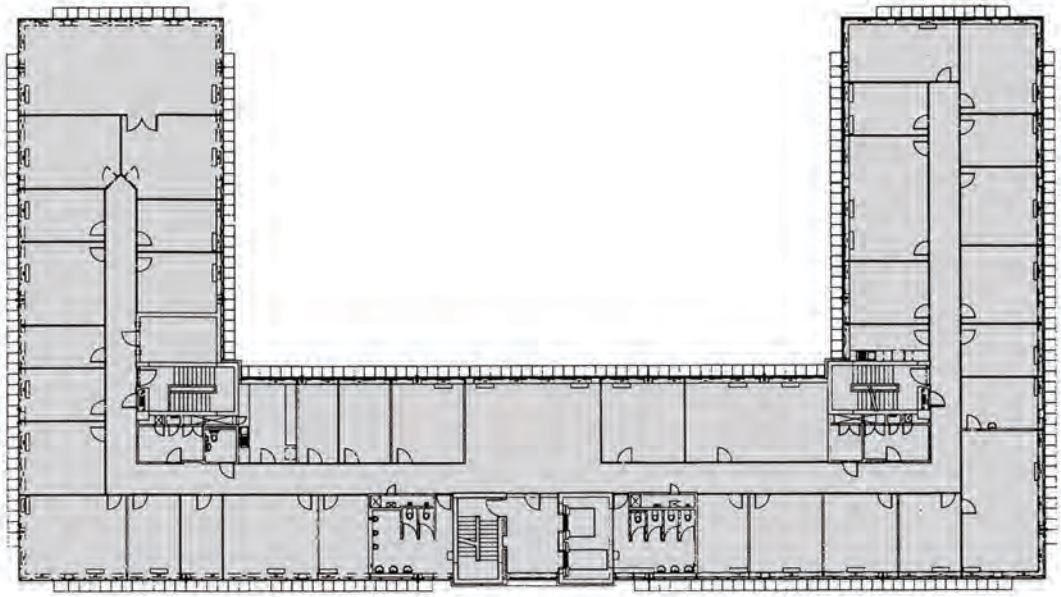

Fig 6.16: Fifth Floor (MLH Architects, 2005).

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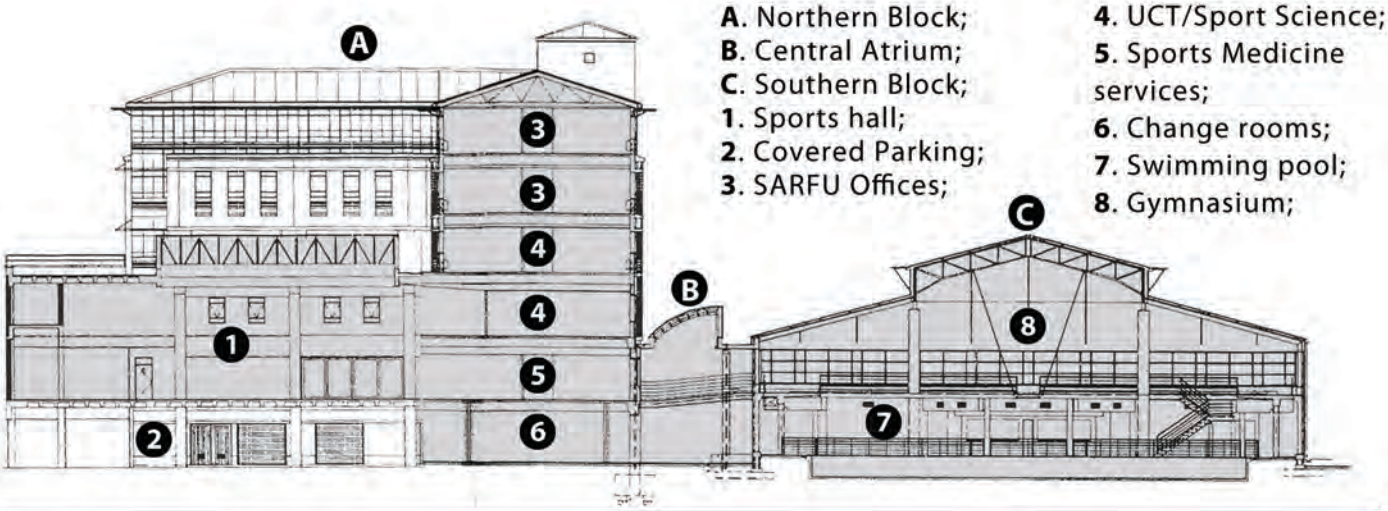

A. Northern Block;
B. Central Atrium;
C. Southern Block;
1. Sports hall;
2. Covered Parking;
3. SARFU Offices;
4. UCT/Sport Science;
5. Sports Medicine services;
6. Change rooms;
7. Swimming pool;
8. Gymnasium;

Fig 6.17: North-South Section (Robertson, 1995: 11).

0 10 20 30

6.2 THE TUKS HIGH PERFORMANCE CENTRE

Project Details:

Architects: Design architect - Don Albert (Soundspacedesign);

Project architect - Elise Bester & Izaak Lotz (KWP Architects)

Client: University of Pretoria, Benstra and the ICON Institute of professional Rugby.

Primary Functions: Services, Teaching and Accommodation related to sport.

Project Area: 8500sqm total area & 5000sqm excluding the 'Lockers'.

Project Location: University of Pretoria, Pretoria, South Africa.

Completion: 2002

Introduction:

The information presented in this case study has been gleaned from a personal visit to the facilities and two semi-structured interviews, unless otherwise stated. The first interview was with Danie du Toit (manager of the Tuks HPC) on the 24th March 2009, the second was with, architect, Don Albert on the 31st March 2009.

The project was initiated by a public-private partnership between the University of Pretoria, Benstra and the ICON Institute of Professional Rugby. The project became known as the "TUKS (University of Pretoria) High Performance Centre" or "HPC" (Fig 6.18). The brief called for a gymnasium, a sport science suite & medical unit, an auditorium, teaching spaces (for academies and Tuksport combined school), boutique hotel, restaurant and bar, an administration building and, in Phase 2, dormitory accommodation (Peters, 2002: 10).

FIG 6.18: THE TUKS HIGH PERFORMANCE CENTRE - SHOWING THE ADMIN BUILDING ON THE LEFT AND MAIN BUILDING ON THE RIGHT.

This building typology is the first of its kind in South Africa; and becomes a 'one-stop' sports facility for professionals and enthusiasts alike. This formula has proven to be highly successful amongst foreign athletes and teams in training, who travel to escape their harsh winter climate in favour of South Africa's attractive, year round weather conditions. This building typology also proves highly popular amongst local athletes, both young and old as it provides an environment which caters for a wide variety of sports, offering highly equipped training facilities, skilled staff, accommodation and nutrition, all in one complex. This allows the athlete to focus on their training period, whilst being monitored over a set number of days, without the hassle of travelling to find appropriate nutrition and medical support. Visiting teams often provide their own medical/science personnel, all they then require is a temporary base, making use of the facilities available, and occasionally the staff.

The primary sports catered for at the HPC include rugby, soccer, cricket, athletics, swimming, table tennis, rowing, golf, squash and gymnastics; however there are other sports which make use of the facilities.

The HPC has a sponsored program called 'Talent ID kids'. This program identifies talented youths of all backgrounds, who undergo specific developmental training. It is currently the only program in the world which takes individuals from grass roots level (usually about 15 years of age) to professional level. The key purpose of this is to harness and develop young talent to provide them with a springboard into global competition. There is a focus on transformation, to sculpt talented kids from disadvantaged communities for 2012 Olympics and beyond.

The mixture of local and international athletes, developing youths and sport enthusiasts, provides an environment of inspiration, motivation and emulation.

This centre is mostly fully booked from January - July and from August – December operates at a 70% capacity. The HPC has been in high demand since 2003 and is already fully booked into the year 2010. The overwhelming response to the sports facility is a clear indication that centres like these are in great demand in South Africa.

The Site:

The Tuks HPC is situated on the University of Pretoria's sports grounds offering 76 hectares of sports dedicated land (Fig 6.20) & (Fig 6.45). The site selection criteria was similar to that of the SSISA; in that the centre needed to be in an established sports precinct in order to make use of existing infrastructure and facilities.

The site is situated within walking distance to a variety of facilities, including; rugby, soccer, hockey, cricket, volleyball and netball fields, an indoor sports centre, an Olympic sized swimming pool, tennis courts and athletic grounds. The site has easy access to public transport and to Oliver Tambo International Airport. This makes the HPC ideal for the full-time training of its academy students as well as for visiting local and international guests.

FIG 6.20: THE HPC WITHIN ITS SURROUNDING CONTEXT (TUKS SPORT, 2008).

Design:

All plans, Section and elevations are grouped at the end of this section (Fig 6.45) - (Fig 6.55).

Architect, Don Albert was the conceptual designer responsible for the project. His design focused the client's representational requests around the notions of Sport, Institution, Media and Campus. The expressive qualities of these notions were analysed and abstracted to inform the dialogue of the built form in order to create an appropriate architectural language. The architectural reference point was the early Modernist tradition that pervades the university campus and the surrounding suburbs of Pretoria, A modern regionalism, yet one that echoes the international agenda (Fig 6.19) (Albert, 2002: 1 & Dekler, 2006: 97).

FIG 6.19: THE ARCHITECTURE EXPRESSES A MODERN REGIONALISM (TUKS SPORT, 2008).

The building has elements such as pilotis, a floating concrete roof and free-standing glass facades, effectively combined with elements common to Pretoria - namely the plinth, mid section and roof. The generous amount of glazing in the building reflects an architecture of openness and transparency, allowing visibility to all surrounding sporting activities from within, whilst revealing the vibrant functionality of the building from the exterior. This however does contribute to the energy consumption of the building. The architecture has strong local roots and ownership but still acknowledges international influences, as it is international exposure that will allow HPC to develop according to international trends and remain competitive.

The built form was organised on site to maximise ones sense of arrival, its connection to the Hatfield High Street, its views of the adjacent rugby fields (Fig 6.47), and to make the functional hierarchies that exist within the program, legible. A uniform language has been employed across the many differing layers (activities), in order to create one cohesive whole (Fig 6.21). The buildings institutional character is expressed through the use of a robust and monumental architectural language (Dekler, 2006: 97). The building is a good example of multiple functions grouped into a single building, where different groups are able to use the building simultaneously (Albert, 2002: 1).

FIG 6.21: THE VARIOUS LAYERS (ACTIVITIES) ARE EXPRESSED INDIVIDUALLY YET CREATE A COHESIVE WHOLE.

The material palette for the building is primarily composed of face brick, off-shutter concrete, and polished screed. These materials perform well as they are hard wearing and easily maintained.

The HPC was originally designed for rugby training, however due to its popularity and high demand for training facilities; it is now used for all kinds of sports. The project comprises of three building types, namely; the Main Building, Administration Building and the Lockers (dormitory accommodation). The main building and administration building form the primary components to the HPC.

Upper Ground Floor (Fig 6.51): The upper ground floor of the main building is the primary entrance to the facility, and is accessed via the portico-like structure of the apparently cantilevering auditorium. This 'hovering' auditorium provides a clear indication of the entrance.

FIG 6.22: THE 'HOVERING' AUDITORIUM PROVIDES A CLEAR INDICATION OF THE ENTRANCE.

This floor of both the main and administration building accommodates the Sport Science and Medical Unit (SSMU), offices and a reception area for both buildings.

The following services are available from the SSMU to both individuals and teams alike:

- Physiotherapy *(initial treatment of injuries, rehabilitation, strapping and massage) - 7 Physio-therapists,*
- Visual Training *(both computer based and interactive on field training) (Fig 6.23) - 2 specialists*,
- Nutrition *(determining dietary needs) - 2 Nutritionists,*
- Sport Medical *(general medical assessment, musculoskeletal assessment, injury management, blood tests, x-rays and sonar scans) - 3 Doctors*,
- Biomechanical and Video Analysis *(Functional movement screening, Injury Prevention, Individual skill and technique assessment, Individual and team game analysis) (Fig 6.24) - 3 Biomechanics,*
- Mental Skills Training & Sport Psychology - 3 Sport Psychologists,
- Strength & Conditioning Programs (Fig 6.25) - 7 trainers.

The greatest advantage of the HPC sport science and medical team is the fact that all the professionals involved operate as a team.

There were however a few problems and spatial requirements for this floor:

- The reception and waiting areas are not functionally large enough.
- There is a need for a separate change room with lockers for clients.
- A private consultation room is needed, which could be shared.
- The medical room's limited, 3m ceiling height is a problem as it is inadequate to do certain rehabilitation exercises (Fig 6.26).
- An ultrasound room would be ideal.
- Access to lecture and board rooms are needed.
- More floor space is needed in general.

FIG 6.23: ON FIELD VISUAL TRAINING (TUKS SPORT, 2008).

FIG 6.24: INDIVIDUAL SKILLS ASSESSMENT (TUKS SPORT, 2008).

FIG 6.25: STRENGTH & CONDITIONING PROGRAM ON THE UPPER GROUND FLOOR OF THE ADMIN BUILDING (TUKS SPORT, 2008).

From this level of the main building the dining/restaurant room (lower ground floor) and gymnasium (first floor) are accessed by ramp and stair respectively and a boutique hotel is situated on the top floor for visiting athletes and sports teams.

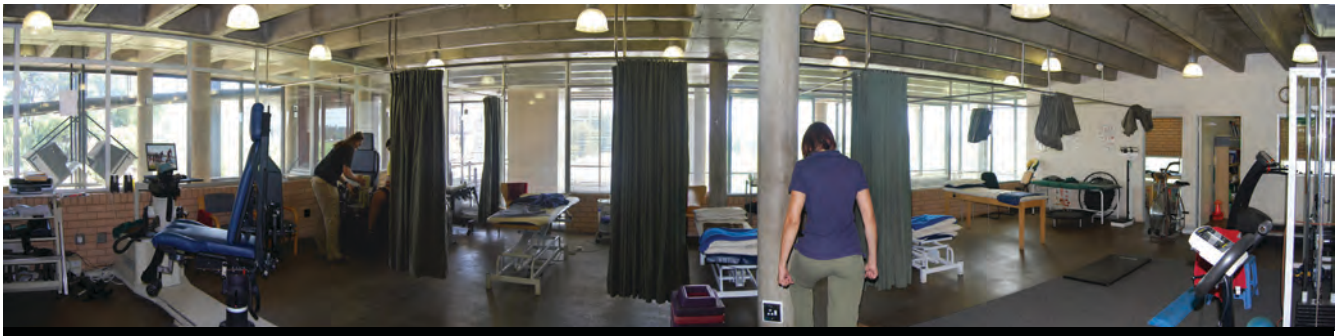

FIG 6.26: THE MEDICAL ROOMS LIMITED CEILING HEIGHT.

Lower Ground Floor (Fig 6.49): The restaurant/dining room on the lower ground floor is a split level space which maximizes views of the adjacent sports fields. As a marketing objective the Medical level is connected visually and volumetrically to the dining and bar areas (Albert, 2002: 1). This restaurant gives athletes the opportunity to obtain balanced and healthy meals which have been pre-determined by a nutritionist, and can therefore be personalized to suit individual needs (Fig 6.27). This space is used for more than an eating/dining space; it becomes the social heart of the facility which is vibrant for most of the day. This area also acts as a staff room for personal. Due to the popularity of the dining room and limited internal space, a large covered area has been retrofitted outside, overlooking the 25m stroke pool (Fig 6.29).

FIG 6.27: THE PROTEAS ENJOYING A NUTRITIOUS MEAL (TUKS SPORT, 2008).

The lecture rooms for the Tuks combined school, on the lower ground floor of the administration building, have become the Institute for Sport Research (ISR); this is where athletes undergo sport specific physiological testing (Fig 6.28). This includes cardio-respiratory endurance, muscular endurance, speed and agility, explosive power, flexibility and body composition. Post testing, feedback includes identification of strengths and weaknesses as well as advice on how to get the individual or team to perform at their peak. It is essentially comprised of an analysis space, testing equipment, offices and a shared consultation room.

FIG 6.28: ATHLETE UNDERGOING SCIENTIFIC PHYSIOLOGICAL TESTING (TUKS SPORT, 2008).

FIG 6.29: A COVERED OUTSIDE EATING AREA HAS BEEN CREATED DUE TO THE POPULARITY OF THE RESTAURANT

There is a problem however with the ceilings being too low for some testing. Most of the analysis is conducted outside on the nearby practice fields or at adjacent facilities. The Tuks combined school now operates at a nearby facility on campus; with a shuttle service between the school and HPC.

The surrounding areas and steps of the facility have been designed to allow for social activities, such as watching people train or relaxing .

FIG 6.30: THE COURTYARD LIKE SPACE BETWEEN THE BUILDINGS IS WELL USED WHEN TEMPERATURES ARE NOT TOO HOT.

First Floor (Fig 6.53): The first floor of the main building accommodates the auditorium and gymnasium component; while the administration building houses the administration offices and boardroom.

"*The auditorium is an off-shutter concrete structure with a raked floor and glass on three sides, with an impressive view of the hockey fields on entrance. The auditorium was expressed on entrance as a signifier of the media role that the institution would ultimately play.*" (Fig 6.31) (Albert, 2002: 1). The Auditorium, seating 81-delegates, has theatre style seating with built-in tables for conferences/presentations. It is also available for big screen match viewing, such as rugby, soccer and cricket. Upon inspection it was revealed that the two side walls of glass had been covered internally to cut out natural light which interfered with viewing presentations on screen (Fig 6.32). The angle of the raked floor is ideal at +- 15°. The number of seats provided is insufficient; there is a need for at least 150 seats.

FIG 6.31: THE AUDITORIUM SIGNIFIES THE MEDIA ROLE THAT THE FACILITY WILL ULTIMATELY PLAY.

FIG 6.32: THE WINDOWS OF THE 81 SEATER AUDITORIUM HAVE BEEN COVERED TO CUT OUT LIGHT.

This gymnasium is primarily for the strength and conditioning of athletes; with only a few members of the public able to use the space due to its limited size. It is stocked with state of the art sports science equipment, and offers unrestricted views of the rugby fields and river beyond through the use of floor to ceiling fenestration. This however creates a problem of direct sunlight as the fenestration does not have appropriate solar control. The northern facade only has partial overhangs (Fig 6.34), while the eastern and western facades are directly hit due to the low lying sun angles. Internal aluminium blinds have therefore been used, however this is not the most efficient means of solar control as it does not prevent heat build-up within the space. The gym is far too small at 430m^2; it is almost full with just one team training. There are currently plans for a larger gym of approximately 5000m^2, which would link to the facility.

FIG 6.34: THE NORTHERN FACADE ONLY HAS PARTIAL OVERHANGS

FIG 6.33: THE GYM IS FAR TO SMALL AT 430m^2 (TUKS SPORT, 2008).

The gymnasium would benefit by; creating a means of passively extracting heat and stale air from the space, as well as introducing more mirrors on the walls for observing ones technique. The waste pipes from the hotel level above are exposed and run across the gymnasium ceiling, as ducts are not taken through vertically. When weights are dropped in the power lifting section of the gymnasium, noise is transferred through the rest of the building. For this reason the power lifting section should be on the ground floor or structurally separated from quieter spaces.

The 145m^2 change rooms of the gym are sufficient in size and are flooded with diffused natural light that enters through floor to ceiling sandblasted fenestration. Extraction fans were retro fitted to deal with steam build-up (Fig 6.35). The paraplegic toilet has been converted to storage which is not ideal. This suggests the need for more general storage.

FIG 6.35: CHANGEROOMS ARE FLOODED WITH NATURAL LIGHT

Second Floor (Fig 6.55): The second floor of the main building is dedicated to the hotel component. It provides 4 star boutique accommodation for visiting athletes and teams. The hotel has 18 rooms with 2 beds per room and can therefore sleep 36 people, more than enough to accommodate a team at a time with coaches (Rugby - 22 players, Soccer – 14 players, and Cricket – 12 players, all including substitutes) (Fig 6.36). Each double hotel room is en suite and has its own private balcony with fin walls which act as efficient solar shading devices for undesirable eastern and western sunlight, whilst focusing views to either the fields or the river. Hotel rooms are often converted to offices for visiting specialists. It would therefore make sense to allow for this flexibility within the design.

FIG 6.36: TYPICAL HOTEL ROOM

FIG 6.37: COMMUNAL LOUNGE

A common area on the hotel level was created in the form of a shared lounge and meeting space for socializing and team gatherings (Fig 6.37). There is a central Internet Station and two large communal balconies which facilitate recreation for visiting athletes and teams (Fig 6.39). This central communal area is bathed in natural diffused light from the clerestory windows of the vaulted roof. This space is connected spatially to the gymnasium via a double volume void, to maximize views and vibrant atmosphere (Fig 6.38). The central bathrooms were closed and converted to storage to gain 4 star hotel status.

FIG 6.38: DOUBLE VOLUME LINK TO GYMNASIUM

FIG 6.39: VIEW FROM COMMUNAL BALCONIES.

The Lockers: 'The lockers' is the term used to refer to the accommodation outside of the primary building. They are essentially 4 buildings, housing dormitory type accommodation, supplying the basics of beds and ablutions (Fig 6.40). The primary users of this accommodation would be students of the institution, visiting school or club teams. The first two lockers are dedicated to guests and the last to permanent academy students. The four 'lockers' are situated away from the main building and arranged alongside the river to make the students feel comfortable (Fig 6.41).

FIG 6.40: 'LOCKER' ACCOMMODATION.

There were however a few problems and special requirements:

- The 26sqm rooms accommodate up to 4 people and include an en-suite bathroom. This is anthropometrically a challenge with 4 people.
- The two communal lounges of each 'Locker' have been converted to offices, as space is limited in the other two buildings.
- Passageways and stairwells are too narrow to allow easy movement of beds and other large pieces of furniture. Therefore passages and stairs need to be wider than 1100mm.
- The W/C of each room is situated internally along passage where natural lighting and ventilation is near impossible.
- Space is also needed for Housekeeping, relaxation areas and a laundry.

FIG 6.41: THE FOUR LOCKERS ARE ARRANGED ALONG THE RIVER IN THE BACKGROUND WHILST OVERLOOKING THE POOL AND RUBGY FIELDS IN THE FOREGROUND.

Other observations:

Due to the fact that the facility has been adapted from accommodating rugby to catering for a multitude of sports, many facilities had to be altered to accommodate the user's needs. In discussion with various persons intimately involved with the HPC, many insightful remarks were noted.

Users have noted the need for:

- More office space
- More private medical treatment offices
- Larger consultation rooms
- Open indoor area with high roof and 40m sprint track for sport injuries and analysis
- The pool should ideally be located indoors with a smaller rehabilitation pool alongside
- Sterile room in medical component
- A dedicated room for x-rays and ultrasound
- More bedrooms
- More classrooms
- Under cover parking for personnel
- More conference/meeting rooms
- Laundry Facilities (as the balconies of the hotel units are often used as areas for drying clothes and towels)

Many of the issues mentioned revolve around the lack of space, it should therefore be noted that there are currently plans to increase the HPC to a size roughly double if not three times the floor area it is currently (Fig 6.42).

FIG 6.42: FUTURE EXTENSIONS TO THE HPC. THE EXISTING AUDITORIUM CAN BE SEEN IN THE FOREGROUND WITH THE NEW BUILDINGS EXTENDING ACROSS THE ROAD IN THE BACKGROUND (KWP ARCHITECTS, 2001: 1)

The brief of this extention called for the enlargement of the existing facilities in order to cater for the ever increasing needs of this popular sport centre. The accommodation will include a new restaurant, various gymnasiums, extra administration office space, a full conference centre, a medical and paramedical wing as well as rentable office space. The new building will focus on maintaining connections to the existing building, while enhancing the arrival patterns of visitors. The new buildings are positioned over the existing road and visitors parking, so as to link the various sport fields together and provide a platform for further extensions in future. This suggests that the HPC has been a successful catalyst for growth in sport and sports science in South Africa. The building is treated in a supporting aesthetic to the existing main building, so that the Original structure will remain the focus of the development.

The existing buildings attempt to cater for disabled access with the inclusion of a main circulation route ramp down to the dining room from the reception area; and an external ramp from the reception area up to the first floor which allows access to the gymnasium; this however is not ideal for gaining access to the auditorium (Fig 6.43). The second floor hotel level does not allow for wheelchair access. A lift would therefore permit easy paraplegic access to the auditorium and hotel level, whilst making it easier to carry luggage to the top floor. Two rooms on the ground floor for of the lockers have been retrofitted to provide accommodation for paraplegic athletes.

FIG 6.43: RAMP UP TO THE FIRST FLOOR OPENS INTO THE GYMNASIUM.

The 18 parking bays are insufficient for staff in close proximity to the building. The 105 bays however are sufficient for visitors.

Most of the facility is exposed to natural light and ventilation, however as the buildings primary orientation is east-west and much of the glazing is left unprotected, the building experiences large heat gains. As a result all spaces are air-conditioned. Passive strategies for temperature control could have been sought to improve environmental quality whilst saving on energy consumption.

The HPC is active for most part of the day. The restaurant is open from 5:30 until 22:30 and the gym is open from 5:30 until 21:30. The hotel component is open 24 hours a day, with a shuttle service on standby at all times. It can therefore be seen that this mixture of uses creates a safe and well used facility. The hotel is controlled with access cards to allow entry into the main building and individual rooms; a security guard is permanently stationed at the entrance to the main building. Adding to the perceived vibrancy of the facility, is the visual connection between spaces vertically and horrizontally (Fig 6.44), between inside and out, allowing for a dynamic and active space.

Relevance to Durban: In a semi structured interview, Don Albert suggested that a HPC for Durban should abstract the notions of; Body, Performance/Efficiency, Dynamics, Media/Communication and Inspiration. He noted that the precinct is about vibrancy and spectacle, and that the building should respond to this. Albert suggested that facility needs to maximise relationships with existing infrastructure and therefore intimate knowledge of surrounding facilities is required. He noted the urban design should be a phased development defining and enhancing the public realm.

FIG 6.44: THE INTERCONNECTION OF INTERIOR SPACES IS CREATED BY MULTIPLE VOIDS AND THE USE OF INTERNAL GLAZING.

Conclusion:

The Tuks HPC has proven to be a successful mix of functions. This was seen in the over populated 2003-2010 bookings and the need to expand the facility to more than double its current size. The tremendous demand for this type of facility in South Africa makes a Durban based HPC a highly viable solution.

The mix of programs has created an environment which is vibrant and safe 24 hours a day. The facility has an inviting and inclusive nature with a definite social heart. The built form responds well to the surrounding views of the river, rugby fields and street; however it is only partially successful with regard to climatic response.

The positive and negative elements, the requests from the users and the spatial requirements/relationships of this case study will be considered in order to formulate a successful brief and schedule of accommodation for the proposed HPC for Kings Park, Durban.

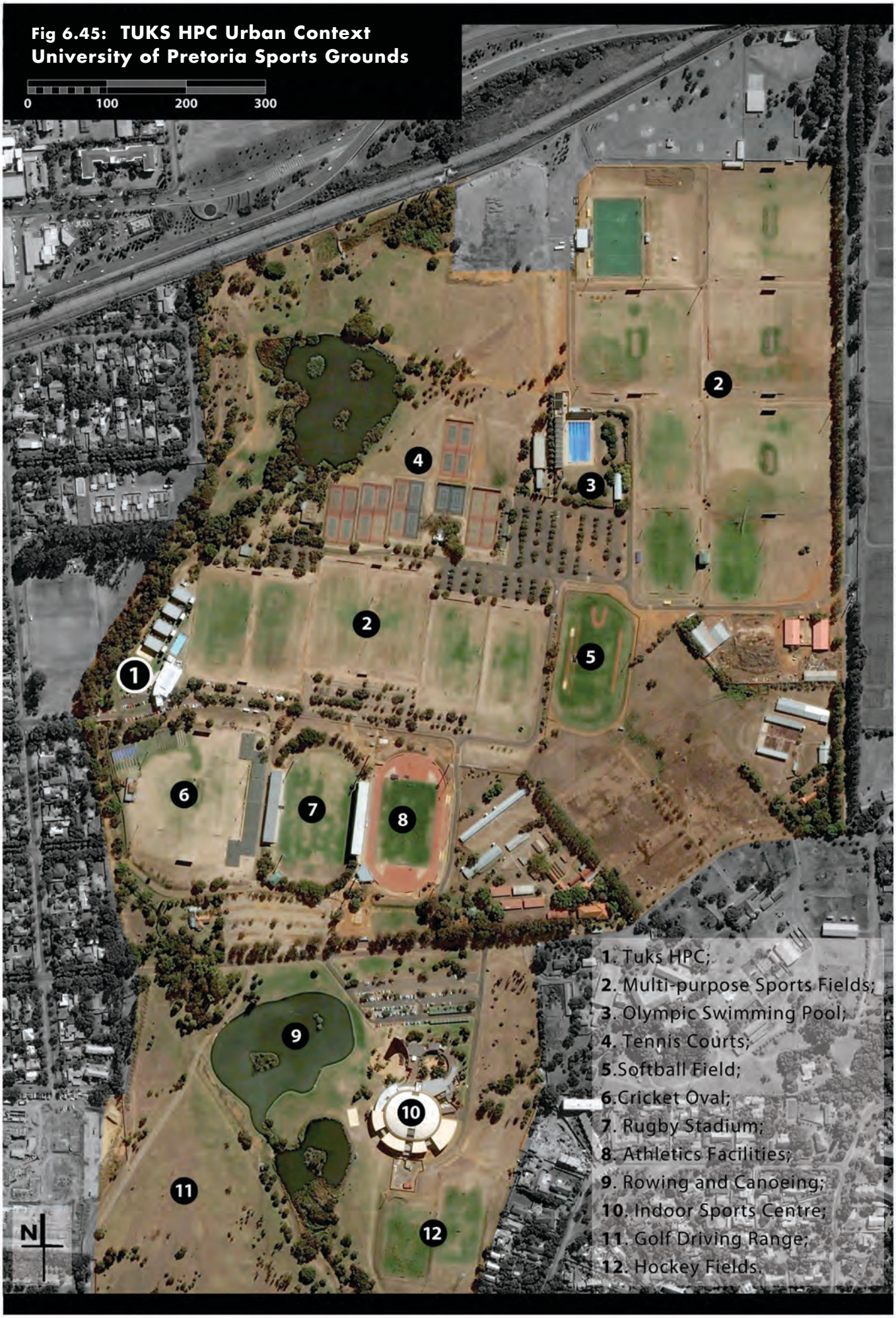
Fig 6.45: TUKS HPC Urban Context
University of Pretoria Sports Grounds
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300
1. Tuks HPC;
2. Multi-purpose Sports Fields;
3. Olympic Swimming Pool;
4. Tennis Courts;
5. Softball Field;
6. Cricket Oval;
7. Rugby Stadium;
8. Athletics Facilities;
9. Rowing and Canoeing;
10. Indoor Sports Centre;
11. Golf Driving Range;
12. Hockey Fields.
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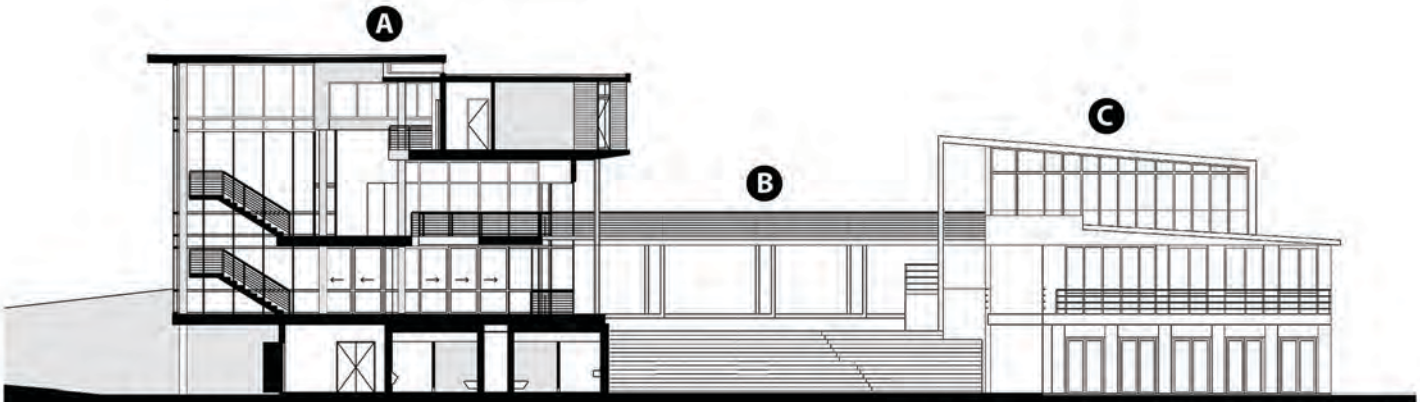

Fig 6.46: Cross Section Both Buildings (Albert, 2001).

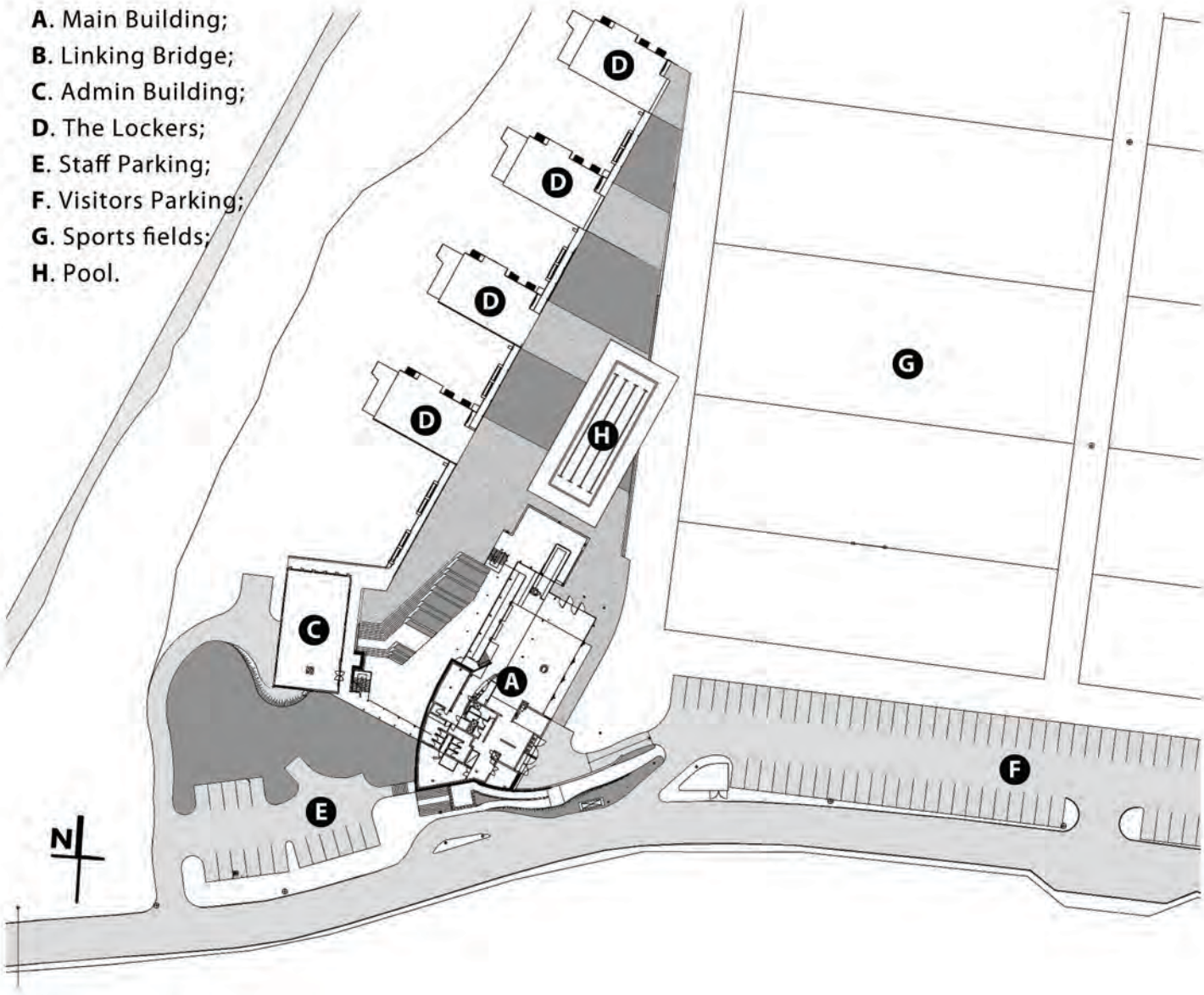

Fig 6.47: Site Plan (Albert, 2001).

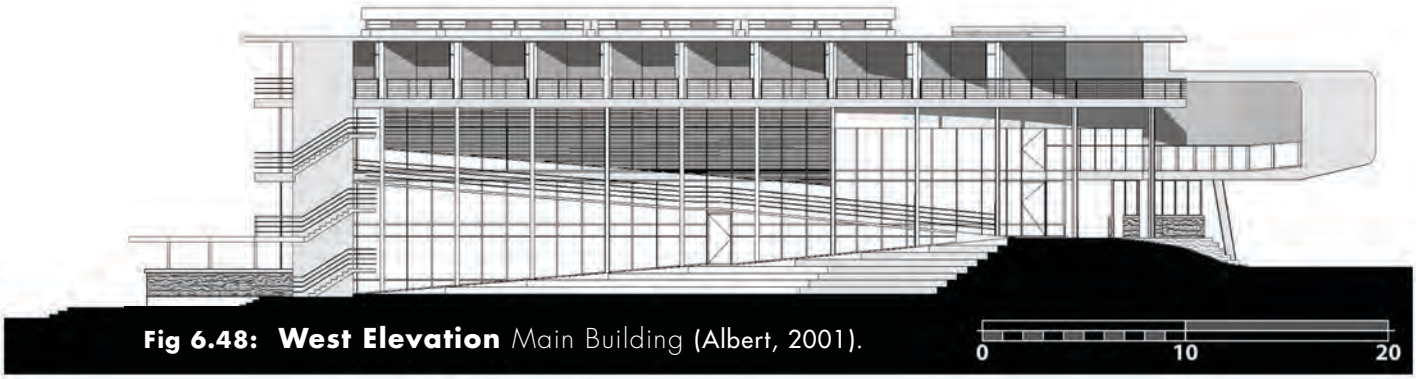

Fig 6.48: West Elevation Main Building (Albert, 2001).

1. Outside Terrace Dining;
2. Lower Dining;
3. Upper Dining;
4. Serving;
5. Cold Room;
6. Kitchen;
7. Refuse Area;
8. Storage;
9. Lecture Rooms converted to Institute of Sport Research.

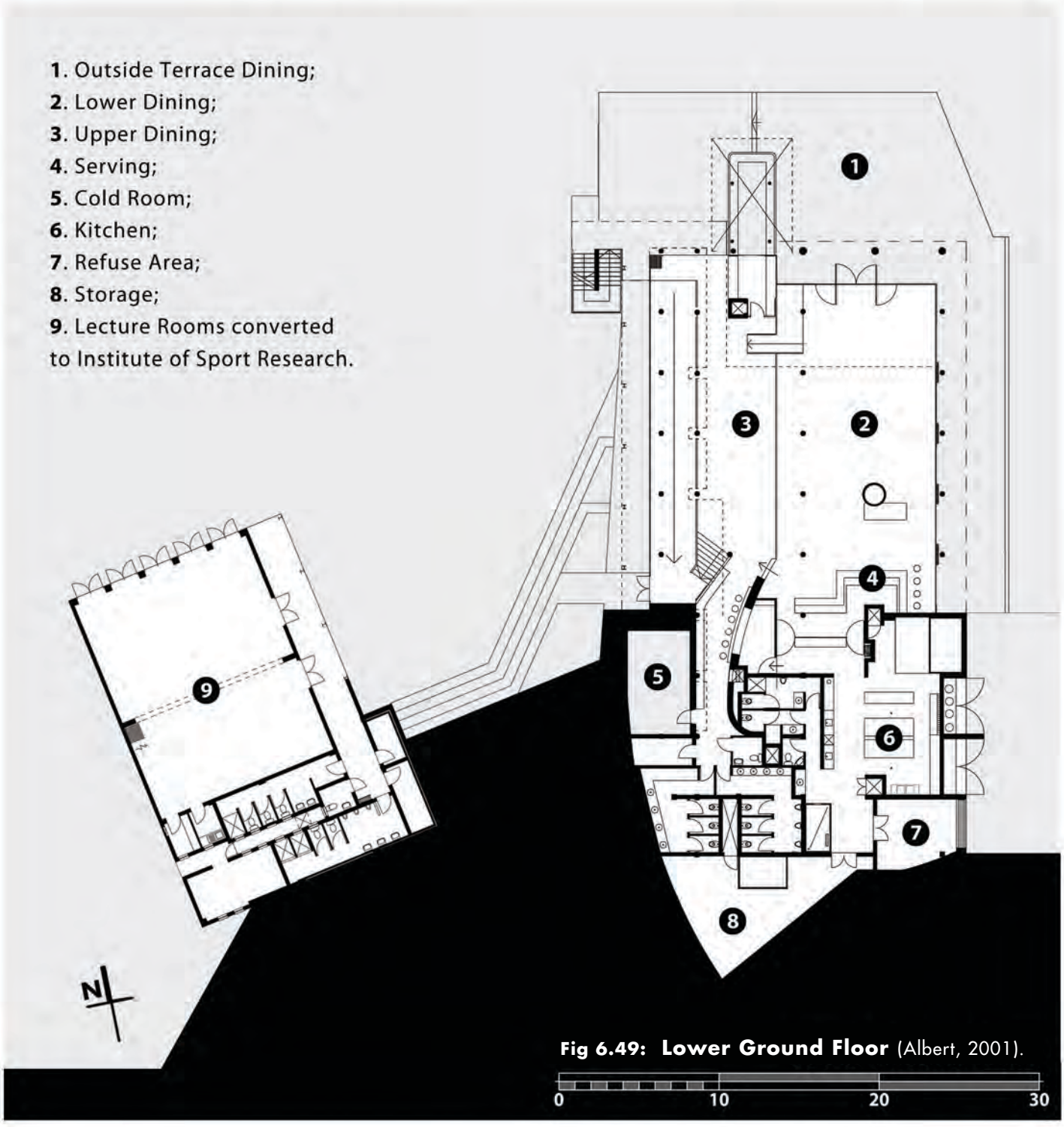

Fig 6.49: Lower Ground Floor (Albert, 2001).

Fig 6.50: East Elevation Main Building (Albert, 2001).

Fig 6.51: Upper Ground Floor (Albert, 2001).

Fig 6.52: Longitudinal Section Main Buildings (Albert, 2001).

1. Gymnasium;
2. Ladies Changeroom;
3. Gents Changeroom;
4. Reception;
5. Offices;
6. Conference/Waiting;
7. Auditorium;
8. Admin;
9. Boardroom.

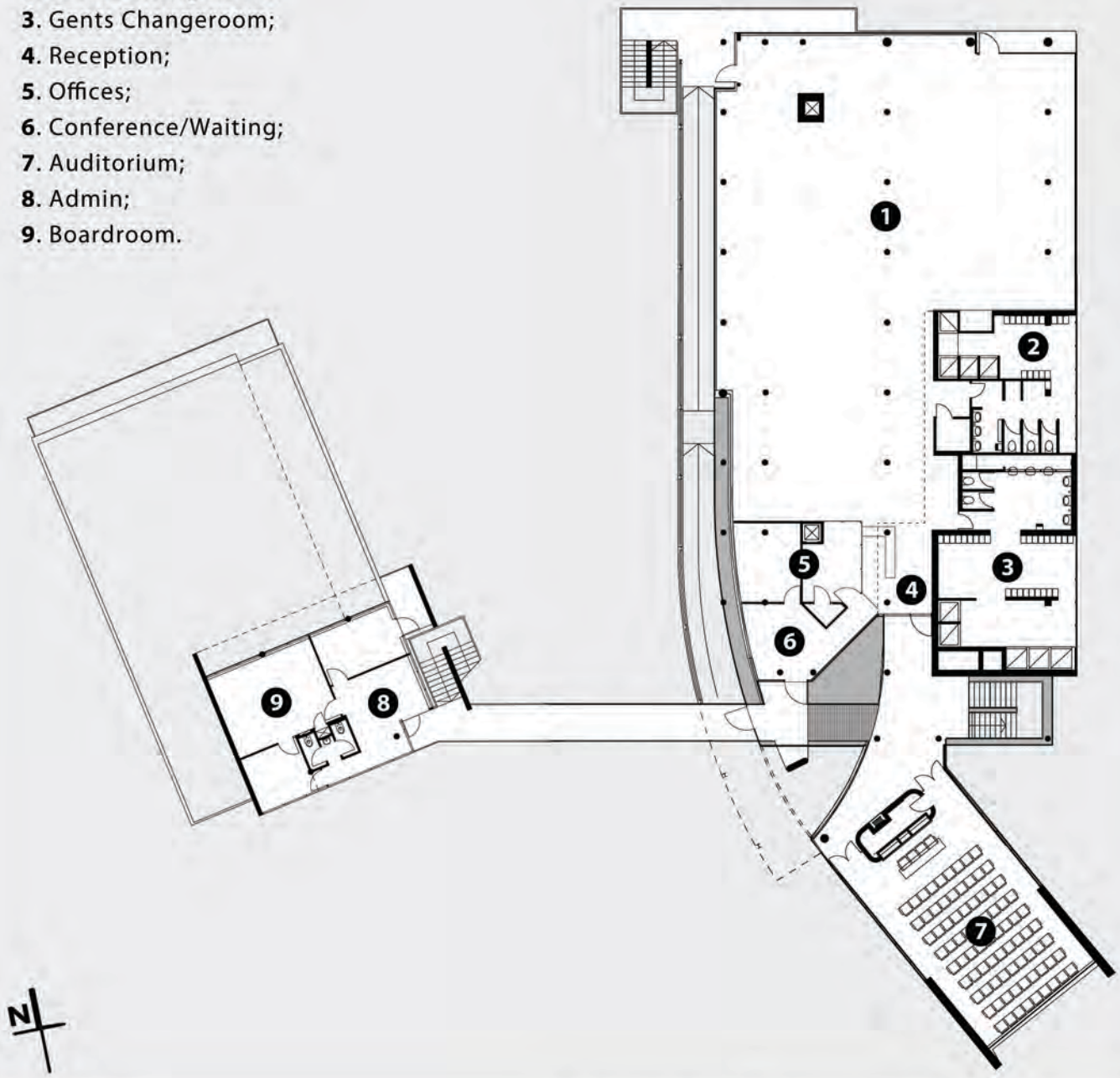

Fig 6.53: First Floor (Albert, 2001).

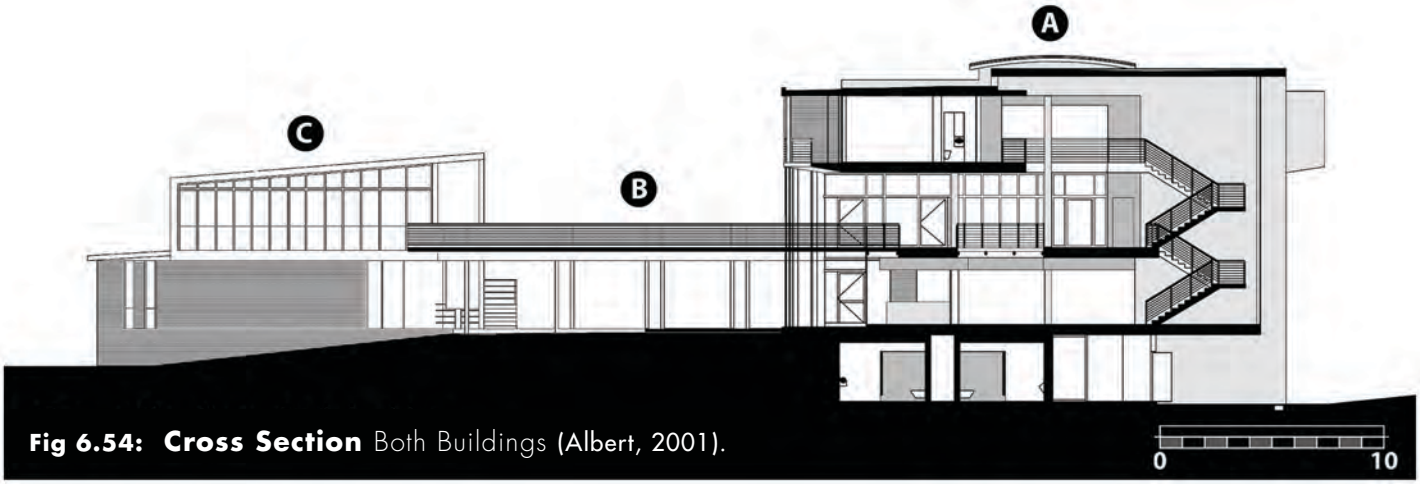

Fig 6.54: Cross Section Both Buildings (Albert, 2001).

A. Main Building;
B. Linking Bridge;
C. Admin Building;

1. Void to Gymnasium;
2. Communal Balcony
3. Communal Lounge and Boardroom;
4. Communal Bathrooms converted to Storage;
5. Rooms;
6. Void;

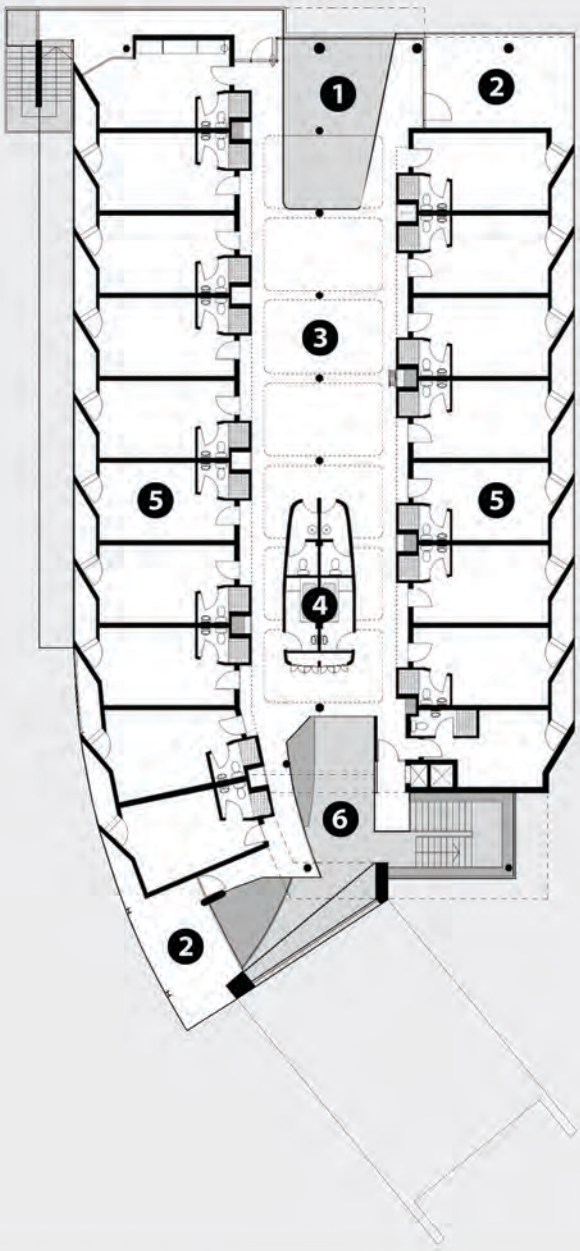

Fig 6.55: Second Floor (Albert, 2001).

6.3 CHAPTER 6 SUMMARY

This chapter focused more on the practical issues of architecture rather than the purely theoretical. The studies analyzed are the only two local examples of architecture which cater to high performance sports. The case studies were the 6.1 The Sports Science Institute of South Africa in Cape Town and the 6.2 The TUKS High Performance Centre in Pretoria.

The majority of this chapter comprised of primary research, with the analysis undertaken first hand, with dimensioned drawings, photographs and a critical evaluation of the buildings. Issues which were revealed included; space and volumetric requirements, spatial relationships, and processes of the buildings, required facilities and technologies, appropriate site selection and other issues. It revealed how architects have dealt with issues of architectural expression, integration into the urban fabric and response to socio-economic and environmental circumstances. This was done in order to gain more insight into the functional requirements of the proposed HPC, providing valuable lessons which can be applied to the design proposal.

These studies will ultimately be used as an important guide/reference to inform a brief and schedule of accommodation for a Durban based HPC. This will be discussed in the next chapter.

7 BRIEF DERIVATION AND SITE SELECTION

The information gleaned from the literature review, theories, precedent studies, case studies and interviews will derive a brief to facilitate the design of a HPC for Kings Park, Durban. The outcome of this chapter will establish guidelines which will result in the design of the proposed HPC. Brief derivation begins analysing the client's aims and objectives for the project. The client would set out guidelines and principles which the architect would work towards.

This chapter will describe; the client, client objectives, funding, users, building requirements and site requirements. This will lead to the drafting of a schedule of accommodation and the description of the spaces therein. An appropriate site will then be selected via a SWOT analysis.

7.1 BRIEF DERIVATION

Client

The Strategic Projects Unit of Durban's City Council have identified the need for a High Performance Facility within the Kings Park Precinct, Durban. The idea has been put into action through the releasing of a 'Consultants Brief' whereby interested parties were to submit business proposals surrounding the development, building, running, and ongoing commercial success of a HPC in the Kings Park Precinct (eThekwini Municipality, 2006).

The client for the proposed HPC would be similar to that of the SSISA in Cape Town. A partnership between the Sports Science Institute of South Africa and the University of Kwazulu-Natal would be most appropriate; creating the necessary critical mass of intellectuals and sporting professionals needed to create an efficient environment for the education, research and development relating to sport in South Africa. Spaces within the facility would be sublet to companies such as Discovery Health, Virgin Active and Adidas.

Client Objectives

The primary client objective is the successful design of a High Performance Centre for the Kings Park Sport Precinct, Durban.

The role of the centre is to enrich the regional and national sporting community by providing easy access to medical and scientific professionals within sport. The centre should incorporate all the necessary components needed to optimise and rehabilitate sports people, on both an amateur and professional level. The HPC should cater for the identification of sporting potential at grass roots level. The identified talent should then nurtured and optimized by scientifically analysed methods and information systems to unlock exceptional performance from potential star athletes.

Research has shown the correlation between success of a national team and increased participation at grassroots level. Studies have also shows that with success comes increased unity and patriotism between various community groups, encouraging a sense of togetherness, and building a stronger national identity (EdComs, 2007: 42).

The HPC will prove critical in attracting international athletes to Durban during their 'off' or winter season; as well as improving local athletes performance, preventing the athletic talent drain to Pretoria and Cape Town, as top KZN athletes are being poached with promises of improved chances of making national teams (Morgan, 2004: 1 & Osler, 2007: 1).

The combined efforts of the HPC should further the advancement of South African sport, harnessing South Africa's sporting talent and thereby improving its sporting prowess.

Funding

Funding will be generated in a variety of ways mainly through public and corporate initiatives; these include: renting of space by practitioners, income generated through the UKZN tertiary education component, the hotel accommodation, restaurant, conference/auditorium facilities and gym. Other means of funding may include sponsorship and advertising.

Users

The users of the building consist of able bodied and disabled users of all ages, such as:

- Professional athletes of international, national, provincial, club and school structure.
- Sports people aiming to improve their performance times or scores through improved fitness and technique.
- The general public aiming to improve their health, fitness and wellbeing.
- Patients requiring rehabilitation or prevention of sporting injuries.
- Professionals in the fields of sport science, sport medicine and coaching.
- Students and lecturers of the tertiary education component.
- Coaches in training.
- Visiting local and international sports people and teams.
- Developing talented athletes.
- Other users may include the general public using the conference/auditorium facilities and retail component.
- The general public using the surrounding urban spaces.

Building Requirements

1. Social Requirements

Community Involvement:

- The local community has a high unemployment rate and therefore one of the main targets of the HPC will be job creation not only in the facility but the sporting community as a whole. As sporting professionalism is considered a career, the HPC will improve an athlete's likelihood of success. Jobs will also be created in the various medical, science, administration and management areas.
- The facility shall cater to the needs of the current precinct users and the perceived increase of precinct users.
- The building shall be designed in such a way that it promotes public ownership, social interaction and an improved quality of life within the community; this will be facilitate by creating an open, accessible and inclusive atmosphere whilst maintaining a certain level professionalism within the facility.
- The environment shall be one that promotes interaction across sporting codes.
- Facilities shall be provided which benefit and cater to the broad spectrum of the community.

User Comfort:

- The Centre shall be fully accessible to wheelchair users. Special changing rooms need to be present for the disabled using the swimming pool, exercise area and gymnasium. Elevators or ramps should be supplemented where changes in floor levels occur, whilst the auditorium needs to be accessible to wheel chair users, both spectators and lecturers alike.
- All spaces shall have access to natural light and ventilation.
- Functions within the building shall operate symbiotically with efficient circulation.
- Spaces should be easily identified to allow for easy orientation within the facility.
- There should be a definite 'social heart' to the facility.
- Create a healthy environment in which athletes thrive.

2. Economic Requirements

- Appropriate spaces should be adaptable and flexible to allow for a greater diversity of uses.
- Majority of the building components, ie: materials, furniture and fittings shall be manufactured locally.
- Running costs and long term maintenance must be taken into account when selecting construction systems and building materials.
- Advertising should be considered as a means of generating income.

3. Environmental Requirements

As a whole the building should aim to create a low carbon footprint, it should tap into the chosen sites potential to explore means of reducing energy and water consumption as well as waste.

The built form and operational systems should be configured as low-energy systems whilst improving internal health and comfort conditions. The architecture should first optimize all Passive Mode (bioclimatic) strategies before proceeding to other modes.

The built form should be embedded in the natural forces of the chosen site, biologically integrating the inorganic aspects and processes of the built environment with the landscape so that they mutually become eco-systemic.

The architecture needs to have an openness and attention to place in order to find fitting materials, fitting forms, and fitting systems, so the built form encourages a healthy relationship with the natural environment. This approach will generate a site specific solution, if relocated, the architecture will not only be illogical, it will be unsuccessful, as it would not achieve its maximum performance.

An important objective to the design will be to maintain and preserve the natural ecological balance in the Kings Park precinct, as it is one of Durban's few remaining green open spaces near the heart of the city.

Other environmental strategies may include:

- Appropriate orientation for good use of natural lighting.

- The building should benefit from natural ventilation. Providing sufficient openings which are correctly designed to facilitate passive ventilation is essential for hot, semitropical and humid climates such as Durban.
- Increases the bio-mass within the built form through green facades, roof gardens and other planting.
- Integrating relevant technologies to harness potential energy.
- Use of materials which have a low embodied energy and are non-toxic.
- All water should be collected for recycling.
- Conserving water by planting indigenous vegetation.
- Passive thermal cooling of the building should be implemented.
- Appropriate shading devices on all facades.
- If there are any courtyard spaces, vegetation should be deciduous to shade the building in summer and allow warm sunlight to penetrate in winter.

4. Design Requirements:

- The health of the buildings users is seen as an essential objective to the design. By exposing the occupants to a healthy built environment, the occupants will be exposed to a healthy building thereby reducing the risk of sick building syndrome and other problems, allowing them to enhance their sporting abilities.
- The HPC should create a symbiotic relationship between surrounding facilities.
- The architectural aesthetic needs to be relevant to the local context and the building typology. Expressing the facilities ethos within the architecture (health, technology, movement etc.)
- The architecture should be open to views of the surroundings whilst allowing views to the activities taking place inside.
- The building needs to be designed in such a way as to facilitate communication between the users of the facility.

5. Construction Systems and Materials

Construction System:

- Ideally, high activity sporting areas should be free of internal columns and other encumbrances and allow adequate ceiling height for associated activities to take place. Areas of multiple stacked floors should be on a separate column grid system. In other words large spans should be separated from shorter spans in order to create an efficient structural system.
- Parking would most likely be limited to ground level or semi-basement, due to the high water table in the precinct.

Materials:

- Large spans would possibly be of a lightweight steel construction whilst shorter spans would be constructed of concrete.
- Glass would allow for views in and out of the facility but caution must be taken to avoid solar heat gain.
- As far as possible, the materials should be sourced locally to stimulate local economic growth.
- The major criteria for selection of materials are durability, aesthetic, cost and efficiency. Corrosion may be a problem for some materials as the Kings Park Precinct will be exposed to salty ocean air.
- The incorporation of media technology into the architecture may be appropriate for advertising or responding to the public realm, through the screening of live sporting events, concerts or exhibitions.
- In order to increase the bio-mass within the building, technologies for greening the built form should be explored (green facades, roofs ect.)
- Certain areas within the building will require specialised technical resolution, such as sports flooring surfaces, wave reducing pool edge, saunas etc.
- Other materials may be required according to application and these will be introduced as the need arises.

Conclusion

The client's brief, functional requirements and users needs will contribute to the development of a schedule of accommodation for the proposed HPC.

7.2 SCHEDULE OF ACCOMMODATION

Required spaces and facilities were drawn from the client/user requirements and local precedents (The TUKS HPC & The South Science institute of South Africa).

Barker's (2008) 'Sports Halls: Sizes and Layouts', & Neufert's (2000) 'Architectural Data' both served to determine certain room sizes.

The numbers of ablutions were calculated using the National Building Regulations 0400 and parking requirement was based on the SSISA's parking ratio.

	Facility	Area m²	No.	Total m²	Spatial Requirements	
1.	**Entrance/Reception:**					
	Entrance Foyer / Waiting Area	90	1	90	Open and Inviting.	
	Reception/Information	22	1	22		
				112		
2.	**Administration section:**					
	General Manager	18	1	18		
	Talent Identification Offices	40	1	40	Can be Shared	
				58		
3.	**Gymnasium facilities:**					
	Entrance Foyer / Waiting Area	100	1	100	Open and Inviting.	
	Gymnasium Office/Reception	47	1	47		
	Gymnasium	575	1	575	Card/Turnstile Access, Link to Sports Hall	
	Exercise Room	48	1	48	Specialised Timber Flooring	
	Spinning Room	43	1	43		
	Stroke Pool	465	1	465	5 Lanes, Wave Reducing Edge, 25m x 12,7m.	
	Pool Store	14	1	14	5 Lanes, Wave Reducing Edge, 25m x 12,7m.	
	Female Showers, Change Rooms, WC and Sauna	100	1	100	Maze Type Entrance, No doors. Includes Lockers.	
	Male Showers, Change Rooms, WC and Sauna	105	1	105	Maze Type Entrance, No doors. Includes Lockers.	
				1497		
4.	**Sport Science Component (Tertiary education):**					
	Reception and Waiting	100	1	100		
	UKZN Staff Offices	14	9	126		
	Boardroom	37	1	37	15 People.	
	Computer LAN with Office	150	1	150		
	Classrooms	67	3	201		
	A/V Editing and Analysis Rooms	28	1	28		
	Biochemistry Laboratory	110	1	110		
	Biochemistry Store	10	1	10		
	Bicycle and Treadmill Laboratories	112	1	112	2 Bicycle, 2 Treadmill and 1 Data Room	

	Facility	Area m²	No.	Total m²	Spatial Requirements	
	Bio-mechanics Laboratory	100	1	100	Access to Sports Hall and Gym	
	Bio-mechanics Store	14	1	14		
	Environmental and Metabolic Chambers	80	1	80	Sealed Rooms	
	Data Room	17	1	17	Attached to Environmental and Metabolic Chambers.	
	Visual Performance Skills	20	1	20	Eye-Gym : Dark Room with Specialised Equipment.	
	Staff Lounge	65	1	65		
	Kitchenette	18	1	18		
	Student Lounge	47	1	47		
	Female Change Rooms, WC	38	1	38		
	Male Change Rooms, WC	38	1	38		
				1311		
5.	**Sports Medicine facilities:**					
	Reception and Waiting	120	1	120	Include Cold Room and Dispensary.	
	Physiotherapy : Consultation Rooms	13	4	52	Access to Physio Multipurpose Space and Sports Hall.	
	Multipurpose Space	165	1	165	Include Storage and Reception	
	Bio kinetics: Consultation Rooms	14	3	42	Access to Sports Hall and Rehabilitation Gym	
	Rehabilitation Gym	123	1	123	Include Storage	
	Nutritionist and Weight Loss: Consultation Rooms	13	2	26		
	Sport / Health Psychology: Consultation Rooms	20	2	40		
	Sports Doctors: Consultation Rooms	20	2	40		
	Orthopaedics: Consultation Rooms	21	2	42		
	Radiology and Ultrasound Room with Office	30	1	30		
	Boardroom	37	1	37		
	Staff Lounge	65	1	65		
	Kitchenette	15	1	15		
	Female Change Rooms, WC	38	1	38		
	Male Change Rooms, WC	38	1	38		
	Store Room	8	1	8		
				881		

	Facility	Area m²	No.	Total m²	Spatial Requirements	
6.	**Multi-Use Sports Hall**					
	Hall	1000	1	1000	Flexible. Linked to 40m sprint track. Specialised flooring. Stack Seating. Min 7.5m Volume	
	Store	45	1	45	Accessed from Sports Hall	
				1045		
7.	**Auditorium / Conference Facilities**					
	Auditorium	208	1	208	160 Seats including areas for disabled users	
	Projector Room	8	1	8		
	Conference Rooms	65	2	130	Flexible	
	Conference Storeroom	20	1	20		
				366		
8.	**Training Academy:**					
	Teaching Spaces/ Seminar Spaces	70	3	210	Access to Surrounding Sporting Facilities	
	Store Room for Equipment	85	1	85	Access from Surrounding Sporting Facilities	
	Kayak Store Room	85	1	85	Access to Waterway	
				380		
9.	**Accommodation:**					
	Boutique hotel: Rooms with En-suite Bathrooms	25	18	450	Maximise Potential Views	
	Boutique hotel: Paraplegic Rooms with En-suite Bathrooms	35	2	70	Maximise Potential Views	
	Boutique hotel: Common Area	53	2	106	Lounge Style Seating	
	Boardroom	44	1	44		
	Internet Facilities	16	1	16		
	Kitchenette	17	1	17		
				703		
10.	**Restaurant and Juice Bar:**					
	Kitchen & Juice Bar	136	1	136		
	Seating Area	450	1	450	Doubles as Staff Room, Public Facility and Student Space	
				586		

	Facility	Area m²	No.	Total m²	Spatial Requirements
11.	**Services:**				
	Security	5	1	5	
	General Store	35	1	35	
	Maintenance Workshop	35	1	35	
	Laundry	25	1	25	
	Lifts	6	3	18	
	Pool Plant Room	78	1	78	
	Chiller Plant Room	58	1	58	2 Chillers
	Bio-Fuel Generator	22	1	22	
	Anabolic Digester	120	1	120	Retention chamber. Volume: 300 000 Litres
	Geothermal Heat Pump	28	1	28	
	Battery Back-up	32	1	32	Include Inverter
	Deliveries Bay	9	1	9	Near Refuse Area. Link to Kitchen
	Refuse Area	13	1	13	Near Deliveries Bay. Back of Site. Link to Kitchen
	Metre Room	6	1	6	
	Switch Room	6	1	6	
	Grey Water Collection Tank	116	1	116	Volume: 290 000 Litres
	Rainwater Collection Tank	173	1	173	Volume: 467 000 Litres
				779	
	Subtotal			**7718**	
	Circulation @ 15%			**1059**	
	Total			**8777**	

	Facility	No.	Area/m² per Bay	Total Area/m²	Spatial Requirements
12.	**Parking**				
	Parking Bays (1 bay per 35sqm of Sub Total)	221	27	**5954**	Parking on Ground or Semi-Basement (High Water Table)

Functions within the Building:

As seen in the schedule of accommodation, the primary components of the proposed HPC include:

1. The Reception / Entrance Foyer ,
2. Administration Section,
3. Gymnasium Facilities,
4. Sport Science Component,
5. Sport Medicine Facilities,
6. Multi-use Sports Hall,
7. Auditorium / Conference Facilities,
8. Training Academy,
9. Accommodation,
10. Restaurant with Juice Bar,
11. Retail,
12. Services,
13. Parking Facilities.

1. Reception/Entrance Foyer: The entrance should be unambiguous, readable and easy to move around. There must be easy access from the entrance foyer to the auditorium, restaurant, toilets, reception and waiting area. The reception/entrance foyer should allow one to orientate themselves to the various functions of the building with visual ease.

2. Administration Section: This component is pertinent for general operations and management of the facility.

3. Gymnasium: The gymnasium is required to accommodate both professional athletes and the general public, (similar to that of the Sport Science Institute of South Africa in Cape Town) providing the necessary equipment and facilities for strength and conditioning training. It may be beneficial to link to the Sports Hall for added vibrancy and convenience.

4. Sport Science Component (Tertiary education): This will form the research component of the facility, investigating factors influencing physical performance and health whilst disseminating knowledge and skills through education. It provides a tertiary education facility for the research and teaching of all aspects of sport. The aim of the research is to develop an understanding of human function during exercise and to use this knowledge to:

- Promote health and well-being.
- Treat and prevent specific chronic diseases.
- Treat and prevent injuries and medical conditions associated with sport and exercise.
- Optimize sporting performance.

Spaces include A/V rooms for the analysis of athlete's movement and game analysis (both team and individual). The biochemistry laboratory to be used for testing, sampling and development in a variety of different sporting applications; such as nutrition, blood and protein testing. The biomechanics laboratory is to be used to analyse an athlete's body movements. This laboratory is equipped with various motion capture cameras, pressure plates and analysis systems. The bicycle and treadmill laboratories are used to analyse various physiological aspects of athletes such as fitness, oxygen usage, heart rate, blood pressure, etc.

The environmental chamber simulates the climate of almost any country in the world, allowing athletes and other individuals to experience adverse conditions and then acclimatise. Temperatures can range between 60°C and -20°C, with humidity anywhere between one and 99 per cent. The chamber can be used to:

- Test clothing tolerance under different climatic conditions,
- Study the effects of enduring extreme environments on sports people,
- Look at the effects of temperature on work-related tasks in the occupational setting.

The metabolic chamber is used for recording physiological reactions of athletes over a number of days. An "eye-gym" is a dark room used to analyse and develop visual performance skills. Other spaces of the sport science component include offices for staff, computer LAN's and classrooms for students, and other ancillary spaces.

This component needs access to surrounding facilities such as practice fields, athletic facilities, Olympic pools etc, as much of the analysis is conducted outside and at other sporting facilities.

5. Sports Medicine facilities: This is to be the service function of the facility, catering to monitoring, diagnosis, rehabilitation and treatment of sports injuries. This component will be available to athletes and the general public alike.

Practitioners include:

- Physiotherapists – Treat and diagnose injuries to the muscular skeletal system. Maximise human movement, function and potential.
- Biokineticists – Analyse human movement and prescribe certain exercise programs for the rehabilitation and prevention of sports injuries as well determining optimal movement pattern in order to improve an athlete's performance.
- Nutritionists / Dieticians – Analyse and develop specific nutritional and dietary programs as per users needs, and supervise the preparation of meals. They help prevent and treat illnesses by promoting healthy eating habits and suggesting dietary supplementation.
- Sport / Health Psychologists – Sport psychology refers to the application of psychological principles to improving sports performance in both team and individual environments. Health psychology applies psychological principles to behaviors and lifestyles that effect a person's physical health.
- Sport Doctors – Cater to general medical assessments, musculoskeletal assessments, injury management, blood tests, x-rays and sonar scans.
- Orthopaedic Surgeons – (consultation only) specialize in the muscles, ligaments, bones, tendons, joints and nerves. Orthopaedic surgeons use both surgical and non-surgical means to treat musculoskeletal trauma, sports injuries, degenerative diseases, infections, and congenital conditions.

The above functions should ideally be located near or in easy access of the rehabilitation gym and sports hall, as this is where practitioners conduct analysis, rehabilitation and develop training programs. Practitioners will also need access to the x-ray / ultrasound room.

6. Multi-use Sports Hall: This space should be flexible and adaptable to a variety of uses and sports. The sports hall will mainly be used by the biomechanics laboratory for analysing athletes in action and general exercise. Various practitioners will also use the space for rehabilitation. The space can also be used by the general public, who may make a booking to utilize the facility for a friendly game, community gathering or function. The space requires high volumes (min 7.6m) and natural light, conducive to a sporting environment. A flexible multi-court shall be used with slide away seating to allow for a variety of different sports. The hall should also be able to be subdivided to allow multiple uses at the same time. The sports hall needs to be attached to a 40m sprint track in order for athletes to reach their maximum sprint speed for video and pressure analysis, this can also be used to monitor bowling performance in cricket.

7. Auditorium / Conference Facilities: These spaces shall be accessible to both the users of the centre and the general public. The secondary lecture room must be adaptable to various audience sizes and my serve as secondary spill over space for the auditorium. The auditorium must; have universal access, be acoustically sound and able to seat 150-200 persons. The Auditorium shall provide a high tech audio-visual environment focusing on comfort and ergonomics. The auditorium will be available for hiring to groups for lectures, conferences and seminars. It will also be able to screen movies and sporting footage at regular intervals for individuals and groups to enjoy.

8. Training Academy: The training academy consists of teaching and seminar spaces for group lectures. These spaces should have access to a variety of practice fields and athletic facilities. Equipment should be stored nearby for training sessions.

9. Accommodation: This consists of a boutique hotel component which accommodates up to 2 teams at a time, including personnel. There should therefore be 36 rooms for up to 72 people, 2 beds per room with en-suite bathrooms. Some of the hotel rooms should be flexible to allow the rooms to be converted to offices for visiting consultants. Common areas shall be provided for visiting teams to socialize and meet. Dormitory accommodation should be planned nearby or shuttle service provided between the university and HPC.

10. Restaurant, Juice Bar: The restaurant shall cater for the needs of athletes, staff (double as staff room), students and general public, providing healthy meals which could be adjusted by a nutritionist to meet individual dietary needs. This space should create a social heart to the facility, allowing the diverse users of the HPC to interact. It should be located near the auditorium/ conference facilities as a marketing objective.

11. Retail: The retail component will provide shops which cater to the needs of the users and surrounding community. Therefore retail should be sports orientated such as shops for sporting equipment/attire and nutritional supplements. Retail should be positioned along a pedestrian circulation route or in an area which gives the retail exposure.

12. Services: In order to service the building one requires: a maintenance workshop, general storage space, delivery and refuse area, plant and meter rooms, laundry, change rooms, lifts and a back-up generator. Services may include a bio-fuel generator, battery store, rainwater and greywater store.

13. Parking Facilities: This is limited to semi-basement or surface parking due to the high water table in the precinct. The parking facilities need to incorporate sufficient paraplegic parking bays due to the nature of the centre. 2 bays should be provided for team/school buses, whilst 196 bays should be provided for staff and visitors. The number of parking needed was based on the parking area to usable floor space of the Sport Science Institute of South Africa in Cape Town, as the precinct and building type is similar to the proposed scheme. These facilities should be landscaped using indigenous planting and broken up into pockets, facilitating efficient pedestrian movement.

7.3 URBAN DESIGN GOALS AND OBJECTIVES

The objective is to create an urban framework for the Kings Park Precinct which will facilitate in the hosting of the 2020 Olympic Games. This framework should resolve the problems of the region, enhance the positive features of the precinct and benefit the people of the city, long after the event has ended. The urban solution should be socially, environmentally and economically sustainable, whilst establishing Durban as the sporting capital of Africa.

The urban design goals and objectives have been derived from the literature review, urban design theories and precedent studies. It was seen in the literature review that, due to the Kings Park precincts poor planning past, facilities have located themselves in an ad-hoc fashion, resulting in isolated land parcels without cohesion with the surrounding urban fabric. This underdeveloped and underutilized tract of land, does not contribute to the city on a daily basis, and ultimately creates 'lost space' within the city.

The primary urban design goal is to create a framework which will maintain and enhance the positive attributes of the region, whilst resolving the negative aspects of the 'lost space'. The objectives will look at creating a sustainable urban design framework which connects with the rest of the city, to ensure an economically viable environment whilst highlighting the uniqueness of the region. The urban proposal will aim to facilitate the creation of a successful public domain within the sports orientated precinct of Kings Park, and provide a framework for the development of the city well beyond the requirements of the Olympic bid.

Many of the aims and objectives for the Kings Park precinct may overlap. The urban framework objectives are as follows:

1. Infilling Lost Space.
    1.1. Creating a Sense of Place.
    1.2. Creating and Enhancing Linkages.
    1.3. Creating Continuity and Enclosure (Figure Ground).
2. Creating a Compact Mixed- Use Development.
3. Creating a Pedestrian Orientated Precinct and Enhanced Public Realm.
4. Creating Urban Catalysts.
5. Creating Opportunity for Cultural Mobility (Fan Parks).

6. Allowing for Flexibility and Adaptability.
7. Planning for a Phased Development.
8. Encouraging Environmental Sustainability.

1. Infilling Lost Space:

1.1. Creating a Sense of Place: What makes a city what it is? There are inherent attributes which make cities unique and distinguishable. Cape Town is known for Table Mountain, Rome is known for its historic architecture, and Las Vegas is known for Gambling. What then are Durban's fundamental existential assets which make it unique?

This objective seeks to respond to human needs and the unique historical, cultural and natural context of a region. The intention is to give the space additional richness and meaning by incorporating unique forms and details indigenous of the setting, thereby transforming space into place. This will be achieved by responding to and reinforcing locally distinctive patterns of development, landscape and culture, as well as creating a holistic environment that has a similar language and strong image-ability. By making the spatial characteristics present in the region the very concept of the urban framework, will provide a consistent design element that will ensure that the venues produce a coherent whole, rather than a series of arbitrary structures.

Kings Park forms a natural arena in the heart of Durban and has the inherent potential to accommodate a full Olympic Park and all the facilities, without having to displace any existing commercial or residential occupants. This objective looks at maintaining and enhancing the Kings Park precinct predominantly as a sport and recreation lung for the city in order to build upon Durban's reputation as 'Africa's Sporting Capital'. Enhancing the existing sporting heart and associated activities will be achieved by consolidating and upgrading many of the surrounding sports facilities whilst enhancing the cultural activities of the region. These activities include the popular post event braai's and celebrations, concerts and exhibitions.

This would mean improving the public space structure by creating a central park for Durban which is defined by a new urban quarter which responds to the associated cultural activities. It is essential that much of Kings Park is kept as open space for recreation and conservation use as the area needs to be able to absorb the massive sporting audiences, future venues and infrastructural demands. This green park area will be designed to link destinations and incorporate a great diversity of spaces to

encourage active and intense use which increases surveillance and safety. Unlike many conventional parks there will be no 'green deserts'.

It will be important to address the limited amount of parking available, especially during an event. A sufficient amount of parking shall be provided whilst not littering the beautiful natural landscape of the area.

The creation of a pedestrianised plaza on Walter Gilbert Road will extend the popular post-event braai's/celebrations and provide common ground between the previously separated black and white sports of soccer and rugby respectively.

Creating an entrance to Durban at the Umgeni Bridge would generate a sense of arrival, identity and place for the local population and visitors arriving from the new King Shaka Airport.

Another important component to the regional characteristics of Kings Park is the surrounding natural environment of the river, harbour, beach and lush vegetation. These elements shall be conserved and enhanced in future developments, which make the most of their inherent beauty and possibilities. Strategies may include; maximising views and links to the ocean, incorporating stringent greening principals into the urban design and architecture, and maximising access to various nodes by connecting the city via green 'arterial' links.

Another strategy was to highlight the natural beauty of the region would be to take advantage of the high water table of the region by reintroducing the original course of the Umgeni River *(which stretched from the Umgeni River mouth to the harbour)* back into the city. Re-introducing the watercourse into the city will create; an organisational element within the proposed urban framework, opportunities for water born transport and additional recreational/sporting prospects, such as ferries, fishing or canoeing.

The aim is to enhance the distinct character and identity of the region in order to promote a sense of place in townscape and landscape.

1.2. Creating and Enhancing Linkages: This objective recognises the disconnected nature of the precinct and seeks to develop an urban framework that will unify the diverse and unrelated spaces, into a continuous, recognizable space which is integrated into the rest of Durban's urban fabric. This will be done in order to promote accessibility and local permeability by creating places that connect with each other and are easy to move through, putting people before traffic and integrating land uses and transport.

Connecting the surrounding nodes of the area will ensure that the precinct becomes a well used and active part of the city. New East-West linkages will be created to improve accessibility through the precinct and avoid the harsh barriers created by the highways and railway which has forced severe spatial imbalances and hindered future development. These linkages shall be both physical and visual, connecting Durban's residential zone to the west of the Kings Park Precinct to the beaches and Durban's Golden Mile to the East. Another goal would be to improve the transportation networks within the region, by providing a new intermodal transport interchange in the heart of the precinct. This will improve local and international linkages to and from the region.

It is not only external connectivity that is critical, linking Durban's existing and future sporting facilities by means of transport, pedestrian and cycle routes would create an enhanced sporting precinct by granting easy access to all facilities. These linkages should connect facilities such as the Kings Park Pools, Sahara Cricket Stadium, Greyville Racecourse, ABSA Stadium and the new Moses Mabhida Stadium. Linkages to the beaches, Umgeni River and Harbour will be required for water sports. These internal linkages have the potential to create symbiotic relationships by sharing facilities. This is of great importance in creating more efficient and well used facilities.

The new linkages will re-integrate the surrounding communities and fragmented region; generating huge social, economical and environmental benefits through increased accessibility.

1.3. Creating Continuity and Enclosure (Figure Ground): As seen in the figure ground study of the Kings Park precinct (Fig 4.5)-(page 55), the urban grain is fragmented in the precinct. The large tracks of sparse and underused land contrast to the dense urban fabric of the city and surrounding precincts. The goal would be to create a gradual transition between the dense surrounding precincts and Kings Park, while increasing density of the Kings Park complex to maintain edge continuity. Bearing in mind

that large areas are needed to accommodate sporting audiences and their movements as well as maintaining the natural park-like environment.

The aim of this objective is to promote a compact urban fabric, continuity of street frontages and the enclosure of space by developing clearly defined public - private areas. This will entail creating a strong urban edge by using building facades to define the street edge and public space. Introducing commercial activity along the street edge will facilitate a vibrant street life with human interaction and activities taking place. All functions on ground floor should add to the activity of the precinct, which is important in creating a successful and walkable precinct which connects destinations.

By relocating the existing rail loading zone to an appropriate site in the light industrial area of Springfield, it will create valuable land in the precinct for a mixed use development. The compaction of the urban fabric will create an efficient city structure able to knit into the surrounding districts, whilst linking the CBD to the Kings Park Precinct.

2. Creating a Compact Mixed- Use Development: Currently the precinct is only well used during sports events, and the area becomes desolate during regular week days, with the only form of vibrancy coming from athletes in training. When events are not taking place at night, the area becomes uninviting or even frightening to walk through. The area remains a sparsely developed and underutilized part of the city. It is important to create a compact city development which benefits the people of the region on a daily basis as the land is highly prized and valuable due to its proximity to the city centre and coast line.

A compact mixed use development will create the critical mass (population density) necessary to avoid the stadium being treated as an isolated object; integrating the precinct and stadium as a meaningful part of the city. The best urban places offer a variety of uses, activities and experiences: living, working, shopping and playing all gain from being linked as opposed to being zoned separately. By introducing retail, residential and commercial components to the region, this will make the area a place to be visited every day. A mixed use development encourages 24-hour activity as the variety of activities take place at different times, thereby staggering the activity throughout the day. This in turn increases surveillance and creates an environment which is active, vibrant and safe both day and night. A compact mixed use development will create shorter travel times between the various components, thereby encouraging a sustainable neighbourhood and city.

3. Creating a Pedestrian Orientated Precinct and Enhanced Public Realm: One of the problems with planning and architecture is that the spaces between the buildings are rarely designed. A building tends to become, in itself, more of an object, separate from its context. Urban designer, Jan Gehl insists that 'A major function of communal spaces in architecture is to provide an arena for life between buildings', here people would be allowed to interact with one another within the in-between zone and provide valuable meeting places to connect the diverse population surrounding the Kings Park precinct.

Jan Gehl's theory is to consider the 'life' then the 'spaces' and finally the 'buildings'. In the context of the Kings Park precinct the desired life would be one of spectacle, fun, beauty, safety and togetherness. The spaces would then need to facilitate this by; creating pleasant areas for walking, squares and plazas that are inviting spaces in which to meet, linger and stay. This offers possibilities of meeting neighbours and co-workers and the opportunity to establish a greater sense of community through acquaintance in a relaxed and undemanding way. In order to create pedestrian friendly public spaces and routes which are attractive, vibrant and safe, appropriate urban furniture must be provided for seating and lighting, shade must be provided from indigenous vegetation, and short walking distances between activity nodes must be created. A legible environment must be promoted to help people find their way around. This will be done by creating recognizable routes, intersections and landmarks. Introducing textures and hard landscaping will better define the environment, and resurfacing roads will indicate pedestrian zones and slow vehicular traffic.

The buildings will need to define these spaces whilst complimenting adjacent activities. This will be done by creating a dense continuous urban fabric which creates active street edges whilst engaging with the surrounding public spaces. These dense urban edges will reinforce the visual quality of the enclosed public spaces. All activities on the ground floor should contribute to the liveliness of the public realm. The heights of the buildings is important, as contact with the vibrant street is lost if the buildings are too tall. However if the buildings are too low it would contribute to urban sprawl. Buildings up to 5 stories in height are in harmony with the way in which people move about, and how the senses function; occupants of the building don't feel isolated from the city below. The built forms of the precinct may incorporate media technology to contribute to the liveliness and spectacle of the area.

4. Creating Urban Catalysts: This objective aims to create "activity generators" or "anchors" which draw people to the precinct and increases pedestrian traffic, thereby creating a demand for secondary uses that fuel adjacent developments. The city identified three major catalytic projects for the precinct, namely; the Moses Mabhida Stadium, future multipurpose indoor sports arena, and the High Performance Centre. These catalysts shall serve to improve the appearance of the precinct by complementing the area. Creating a series of catalytic projects for the Kings Park precinct would be a holistic approach to revitalising and reintegrating the area into the surrounding urban fabric. Instead of the new stadium becoming a freestanding icon. The next catalytic projects will generate additional density, public space and surrounding activities to support it; thereby creating a successful collective space.

5. Creating Opportunity for Cultural Mobility (Fan Parks): Forging common ground between fragmented community groups remains a major challenge in South Africa. Fan parks are seen as a positive initiative to the solution of this problem, as Maurice Halbwachs observed, '*...what builds solidarity is shared lived experience*'. These new communal public spaces focus on the prospect of creating urban environments which facilitate "cultural mobility", i.e. places where people with different cultures and lifestyles can meet and share new experiences - spaces where a change of perception is possible (Foster, 2008: 68-69).

As Trancik notes, extracting the social criteria of a particular area and translating them into the design process leads to the creation of social space appropriate to the activities it contains (Trancik, 1986: 88).

Establishing a permanent fan park for the Kings Park Precinct shall create a public gathering space which would accommodate many different people and lifestyles, acting as a 'cultural melting pot' and becoming 'the meeting room of the city' encouraging social change. It would provide the ideal opportunity to enhance the post event celebrations which are so popular within the Kings Park precinct, whilst creating spill over space around the stadium. This space would have to simulate the exhilarating atmosphere found inside stadium during matches. It will essentially be a public outdoor venue transmitting live images of games played throughout the country onto massive AV screens, providing a space for fans to watch matches at no cost; making events accessible to all. This public space should be vibrant and festive, becoming a spectacle in itself in which the event makes the space as much as the space makes the event. A Fan Park responds to the needs of the people of the

region in an appropriate typology for the area, whilst permanently expand the repertoire of public space within Durban as a whole (Foster, 2008: 69).

6. Allowing for Flexibility and Adaptability: A goal would be to promote adaptability through a development which responds to changing social, technological and economic conditions. Due to the varying nature of adapting the area to host a major event such as the Olympics, to an area which benefits the city on a daily basis, it was necessary to incorporate flexibility both into the urban design and built form. A key priority of the urban framework is to ensure there would be no 'white elephants' once a major event had ended. Any low-intensity uses of the area should therefore be relocated, as they do not contribute to the liveliness of the public realm.

7. Planning for a Phased Development: It is important to design the urban framework for incremental development and growth within the precinct. Gradual transformation in urban redevelopments make interventions sustainable and give people time to settle into the physical changes, adjust their life styles, and experiment with the new ways of using the city. Gradual transformation allows for greater flexibility in the design process; after experiencing the positive and negative aspects of the space, changes can be made.

8. Encouraging Environmental Sustainability: The scale of this development offers the opportunity to introduce innovative systems that demonstrate a new way forward for sustainable urban living. The framework shall harness natural sources of energy; harvesting wind power, utilizing the ground as a source for heating and cooling, and capturing solar energy. The architecture throughout the area shall been designed to reduce energy demands and incorporate environmentally responsible materials. To reduce waste, most existing facilities will be retained or upgraded and any demolition material shall be re-used in future structures or recycled.

The aim of the urban framework will be to protect and enhance the biodiversity and ecology of the region by maximising positive impacts on land, water and air quality. The built environment shall be designed to be integrated within the natural landscape both systematically and aesthetically. Access to public transport shall be improved and the precinct shall be made a pedestrian friendly environment which is accessible to all.

Conclusion: The urban design aims and objectives discussed above will be used to inform a proposed urban framework for the Kings Park precinct.

This framework will help resolve many of the issues which contribute to 'lost space' within the precinct; creating a sense of place, enhancing linkages and creating continuity and enclosure within the urban fabric. The framework will create a compact mixed use development which is safe, sustainable, well used, and vibrant at all times. It will focus on creating a pedestrian orientated precinct whilst enhancing the public realm. Catalytic projects will create the necessary population density for secondary development to thrive. The urban framework will promote 'cultural mobility' in the form of a permanent fan park which will encourage interaction between the diverse local communities. The urban masterplan will remain flexible and adaptable to change whilst developing in incremental stages. The urban framework will aim to create a sustainable city, socially, economically and environmentally, which provides the necessary structure for the proposed HPC to be successfully integrated.

7.4 SITE SELECTION

7.4.1 Site Requirements

The final site for the proposed HPC will be selected using various criteria. The main criteria are as follows:

- **Location:** As seen in both case study examples, the site needs be located within an established sport precinct to make use of existing infrastructure and facilities; thereby creating a symbiotic relationship between similar functions or interests. For this reason the site will be located within the Kings Park Sport Precinct. The site should be situated central to - and within easy walking distance of facilities which benefit most sports, such as; practice fields, athletic facilities, Olympic pools, ocean sports etc. It would also be beneficial to be situated within walking distance of the Moses Mabhida Stadium for, use of facilities and convenience for athletes staying in the hotel component.

- **Access to Public Transport:** The site should have good accessibility to public transport, from both a local and international point of view. As the site will be located within Durban's Kings Park Precinct, it will be in reasonable distance from the new King Shaka Airport (30min by car). The site should be within walking distance of a transport interchange to maximise convenience for the local population. The convenient walking distances and accessibility to public transport would help facilitate a pedestrian orientated precinct.

- **Site Area:** The size of the site must be able to accommodate all the necessary scheduling components of the proposed HPC.

- **Physical Features & Environmental Conditions:** Climatic conditions are very important, the low diurnal variation of Durban is best in catering for sports on a year-round basis, however due to this fact; specific wind patterns need to be carefully considered. A site at a uniform grade would be most suitable for the siting of large enclosed and open spaces such as sports halls and fields. The high water table in the area may make full basement parking an issue, however it may allow for opportunities of reintegrating the river back into the city. Any existing vegetation and structures on site needs to be considered.

- **Orientation:** The site should be orientated in such a way as to promote a healthy and vibrant site, not overly shaded by neighbouring buildings. Good cross ventilation is essential. Its orientation should allow views from the site to the surrounding context. A north to north east orientation will make it easier to achieve optimum building performance with regards to thermal comfort and lighting levels. If located within a public domain the building should address the public space.

- **Pedestrian Access:** Conducive to easy, direct and unhindered access by pedestrians engaged in sports or sports medical related activities in the nearby vicinity.

- **Vehicular Access:** Access for private vehicles, public / private transport vehicles, as well as service / delivery vehicles is important.

7.4.2 Choice of Site & Final Site Selection

The three sites selected are situated within the proposed urban framework for the Kings Park precinct.

Site Analyses began with a SWOT analysis of each site to determine the strengths, weaknesses, opportunities, and threats of the individual sites.

A table was then drawn up using the site requirements of: Location, Access to Public Transport, Site Area, Physical Features and Environmental Conditions, Orientation, Pedestrian and Vehicular Access. Each site was analyzed using this criteria and given ratings according to their performance in each category. These two analyses ultimately facilitated in selecting the final site for the design of the High Performance Centre.

SWOT Analysis

A SWOT analysis was carried out on all three sites to test the validity of building a High Performance Centre, the following finding were recorded:

FIG 7.1: THE THREE SITE OPTIONS FOR THE PROPOSED HPC WITHIN THE NEW URBAN FRAMEWORK FOR THE KINGS PARK PRECINCT.

Site Option One:

Site One is situated two sites north of Collegians Athletics facilities.

Strengths:

- Entrance off NMR Avenue makes for easy to find and access.
- Pedestrian access to the site is safe and convenient.
- Predominantly northerly orientation for good use of natural light.
- Flat topography.
- Good access to surrounding sports facilities.
- Good access to public transportation off Walter Gilbert Road.
- A site area of 9100m^2 is perfect for the proposed HPC.

Weaknesses:

- Fairly close to a main road which may cause a problem for hotel component due to noise levels.

Opportunities:

- Access to waterway for training.
- Easy access to beaches & promenade for ocean sports and training runs.
- Adjacent to multi-use fan-park. Opportunity to engage with this public space.

Threats:

- There are no inherent threats to this site.

Conclusion

Site One's main asset is the fact that it is has a good orientation. One main disadvantage of this site is that it is relatively close to a main road which may cause noise problems for the hotel component. However, overall, Site One seems to have many advantages and the potential to be a successful site for the proposed HPC.

Site Option Two:

Site Two is situated on the site north of the current ABSA Stadium.

Strengths:

- Good access to surrounding sports facilities.
- Pedestrian access to the site is safe and convenient.
- Flat topography.
- Good access to public transportation off Walter Gilbert Road.
- Predominantly northerly orientation for good use of natural light.

Weaknesses:

- Development may be dwarfed by adjacent stadium.
- A site area of 19700m^2 is too large for the development of a HPC.

Opportunities:

- Adjacent to multi-use fan-park. Opportunity to engage with this public space.

Threats:

- HPC may be at risk when ABSA Stadium is being converted to tennis stadium.

Conclusion

Site Two's main asset is the fact that it has excellent access to surrounding sports facilities. One disadvantage of this site is the orientation which is primarily east-west facing. Overall, Site Three seems to have many advantages and the potential to be a successful site for the proposed HPC.

Site Option Three:

Site Three is situated on the site north of Collegians Athletics Facilities.

Strengths:

- Excellent access to surrounding sports facilities.
- Entrance off NMR Avenue makes for easy to find and access.
- Pedestrian access to the site is safe and convenient.
- Flat topography.
- Good access to public transportation off Walter Gilbert Road.
- Development of this site would help create the critical mass necessary for a vibrant node which would catalyze future developments.
- A site area of 8300m^2 is perfect for the proposed HPC.

Weaknesses:

- Orientation is primarily east-west facing. This makes it difficult for the building performance with regards to thermal comfort levels, lighting etc.

Opportunities:

- Adjacent to athletics facilities and running track. This is would be a major asset to the HPC.
- Access to waterway for training.
- Easy access to beaches & promenade for ocean sports and training runs.
- Adjacent to multi-use fan-park. Opportunity to engage with this public space.

Threats:

- There are no inherent threats to this site.

Conclusion

Site Three's main asset is the fact that it has excellent access to surrounding sports facilities. One disadvantage of this site is the orientation which is primarily east-west facing. Overall, Site Three seems to have many advantages and the potential to be a successful site for the proposed HPC.

Site Selection Table

A table has been drawn up (Fig 7.2) to show the comparisons between the selected sites and a rating out of ten has been given to each of the sites for their performance under a particular criteria.

Site Selection			
Sites:			
1	Situated two sites north of the Kings Park Athletics facilities.		
2	Situated on the site north of the current ABSA Stadium.		
3	Situated on the site north of Collegians Athletics Facilities.		
Site Selection Criteria	**Site 1**	**Site 2**	**Site 3**
Location	8	6	10
Access to Public Transport	7	8	8
Site Area	8	5	9
Environmental Conditions	8	7	9
Orientation	8	8	7
Pedestrian Access	9	8	9
Vehicular Access	8	7	8
Total	**56**	**49**	**60**

FIG 7.2: TABLE COMPARING THE THREE SELECTED SITES

Final Site Section

Site Three was chosen. After applying the site criteria, Site Three received the highest rating. The main advantage of Site Three is that it has excellent access to surrounding sports facilities. This is of utmost importance as a HPC does not operate in isolation. The site allows for many opportunities, such as, access to the waterway and athletics facilities for training. It is adjacent to the multi-use fan park which allows the building to engage with this public space. It is close to the beach to cater to ocean sports and allow athletes to uses the promenade for training purposes.

7.5 CHAPTER 7 SUMMARY

This chapter was used to derive a brief for the proposed urban and architectural intervention. It discussed the client, client objectives, funding, users and building requirements. It derived a schedule of accommodation and discussed the functions within a high performance centre. It stated the urban design goals and objectives and analyzed three sites in order to determine the best site for the proposed HPC.

Ultimately the proposed High Performance Centre should respond both to the users needs and the selected sites constraints and opportunities.

8 CONCLUSIONS AND RECOMMENDATIONS

This chapter will discuss findings which respond to research problems and hypothesis with ways forward. It will draw conclusions to the information gathered and state the contributions made by the results.

This chapter is composed of three sections, namely:

8.1 INTRODUCTION

The research set out to explore the significance of sport in society and its influence on the urban fabric and architecture. The hypothesis was, *"to determine an appropriate architectural/urban design intervention for Durban, in order to harness South Africa's sporting talent, uplift an area of 'lost space' and create a meaningful architectural response".*

This chapter discusses how the three primary research objectives and hypothesis (page 5) have been responded to throughout this document in order to resolve the research problems. The objectives began from the broad context and narrowing to the more specific, namely the 'Social', 'Urban' and 'Architectural' objectives.

8.2 FINDINGS

Social

The first objective explored the social aspects of sport and its influence on culture, specifically with regard to nation building in South Africa.

The Commonwealth Government noted that,*"It is time that the integral role which sport plays in the process of nation-building is fully recognized. Sport is an investment. It is firstly an investment in the health, vitality and productivity of one's people. It is secondly an investment in their future. The social benefits include an overall improvement in the quality of life and physical, mental and moral well-being of a population. Furthermore, successful athletes serve as role models for the youth of the country, as achievers, as unofficial ambassadors, and as individuals committed to equality and fairness in competition*" (Department of Sport and Recreation South Africa, 2002: 2).

It was discovered that sport in South Africa has played a major role in eliminating the apartheid's unethical policies. However it still faces the problem of 'nationalizing' its people, that is, unifying distinct cultural, ideological, religious and racial community groups. The phenomena of the 1995 Rugby World Cup proved that sport has the ability to promote unity between people. It was noted that sport still had a significant role to play as an agent and catalyst for significant social change in South Africa. However due to the inequalities of apartheid politics and the subsequent international sports boycott, South Africa has not been able to develop all sporting codes to their true potential.

This was most evident in the recent 2008 Beijing Olympics where South Africa could only achieve one silver medal, the nation's worst showing, in the history of the games. Due to metonymic relationships shared between nations and their athletes, much disappointment was felt within the South African community.

The superior performances of the modern-day athlete are the product of a complex interaction of physiological, biomechanical, nutritional and psychological factors. Coaches today recognise that the most consistently effective methods of preparing his/her athlete for the demands of international competition are those based on proven scientific principles, rather than on trial and error. It has therefore become commonplace for countries to establish Sports Institutes or High Performance Centres (HPC's) for the coach and athlete to seek input from qualified sports scientists in order for the athlete to reach his/her full athletic potential. A strong case was therefore put forward that, those countries which are not competitive in the sports sciences, will ultimately become non-competitive in the international arena (Prof. Timothy Noakes, SSISA, unpublished interview 12th December 2008).

It was seen that the only two local examples of these centres are; the Sports Science Institute of South Africa in Cape Town and the High Performance Centre in Pretoria. KwaZulu-Natal is a major province yet to develop a sports institute or HPC. From this research it was deduced that a HPC for KwaZulu-Natal was the most appropriate architectural typology to successfully harness South Africa's sporting talent.

Taking into account all the aspects of a HPC it was seen that the facility would best be sited in the Kings Park Precinct, Durban. This was consistent with past proposals and case studies, which were all located within established sporting precincts. This would maximise use of, and support existing infrastructure and facilities, thus creating a symbiotic relationship between functions and complementing the Kings park complex. The surrounding world class facilities will be actively used in the daily functioning of the facility. Locating the HPC within the Kings Park Precinct will allow easy accessibility to the majority of people in the region as it is located along major transport corridors and central to a high population of diverse communities. The favourable regional climatic conditions and geographical features were seen as ideal for the proposed HPC. The precincts proximity to the river, ocean and harbour make it accessible to ocean, rowing and sailing sports. It also allows visiting athletes convenient access to beaches and promenade for scenic fitness training. Durban's year round, warm subtropical climate is ideal for an outdoor, sporting lifestyle. The warmer climate also reduces the

risk of contracting general ailments such as flu thereby reducing an athlete's downtime. This will be critical in attracting international athletes to Durban during their harsh winter months.

A world class HPC for Durban will have a positive impact on the neighbouring communities by providing grounds for interaction between a diversity of users. The facility will act as a vehicle in successfully binding various cultures and community groups; locally, nationally and globally. It will achieve this by using sport as common ground within society, creating an interface for social interaction between the diverse users of the HPC. The combined efforts of the HPC would further the advancement of South African sport, improving its sporting prowess. Research has proven the correlation between success of a national team and increased participation at grassroots level. It also shows that with success comes increased unity and patriotism between various community groups, encouraging a sense of togetherness, and building a stronger national identity (EdComs, 2007: 42).

Urban

The second objective narrowed its focus to the use of the sports event (Olympic or Commonwealth Games) as a means of generating an urban intervention which uplifts an area of 'lost space' within the Kings Park Precinct. It was found that Durban has for a long time recognised the positive roll that major sports events play in the development of a cities; infrastructure, international recognition and economy. However has yet to developed its sporting precinct to the level of other international sport-scapes.

Trancik notes, all urban projects are different, requiring unique formal responses to the conditions inherent in the place in time. It was for this reason that the research then investigated the historical and current context of the Kings Park Precinct. This provided the necessary information to create an appropriate urban design intervention which enhances the positive features and resolves the negative aspects of the precinct (page 47). This developed indicators as to the relevant urban theories which respond to these unique aspects of the precinct.

- Firstly the theories of Roger Trancik and Kevin Lynch were investigated to reintegrate the 'Lost Space' of Kings Park Precinct with its surrounding context.
- Secondly, the theories of compact cities and mixed use developments were examined to create a safe, well used environment which is vibrant at all times.

- Thirdly, Jan Gehl's theories of life between buildings were analysed to create a successful public realm.

- The fourth section briefly examined the theories of catalytic developments, as a High Performance Centre (HPC) is seen as one of the three major catalytic projects for the precinct. This established the important role of these development types.

- Lastly the theory of 'cultural mobility' was explored to encourage social interaction between the diverse local population. This guided the research to the relatively new urban typology of 'Fan Parks'. These spaces will create common ground within society, allowing opportunities for interaction between people of different cultures and lifestyles, allowing a change of perspective.

The above mentioned theories aim to directly inform an urban design framework which is integrated with the rest of the cities structure, resolving many of the negative aspects and enhancing the existing positive features of the precinct. The aim of the urban framework will be to create a successful urban space which is well used and vibrant at all times – both during events and regular week days. Another key element of the urban design would be creating spaces that facilitate new interactions and experiences between people of different cultures and lifestyles – creating common ground which would allow for society to interact, encouraging an interrelationship and unity between each other – 'nationalising the people'. Ultimately the urban framework will provide the necessary framework for the proposed HPC to be integrated into the Kings Park Precinct.

Architectural

Architect and author, David Leatherbarrow notes that the current tendency in architecture is to separate identity and function, which has divided the interaction between the building, the user, and the environment. Architect, Tadao Ando believes that, "*architecture is never simply a method of problem-solving, whereby given conditions are reduced to technical issues. Architectural creation involves contemplating the origins and essence of the project's functional requirements and the subsequent determination of its essential issues. Only in this way can the architect manifest in the architecture the character of its origins, creating a rich and variable architecture.*" (Jencks, 2006: 256).

The first part of the final objective therefore focused on identifying an appropriate and meaningful architecture, which is responsive to its users and surrounding environment, whilst expressing the ethos of the buildings typology.

The HPC was perceived as an abstract notion of the activities taking place inside, in order to express the ethos of its typology. Functionally, a High performance centre is about using advanced technology to optimise performance, health and efficiency within the human body. Therefore similarly, parallels were drawn in architecture, where the built form is combined with advanced technology in pursuit of a healthy/ecologically sustainable built environment which functions in an optimal way. The architectural expression will therefore aim to create an environmentally sustainable intervention in which the buildings 'performance' between user and surrounding context becomes a generator for the architecture.

The users of a HPC require a healthy environment to perform at their best. It was therefore seen to be appropriate to expose the occupants to a healthy environment within the building, thus reducing the risk of sick building syndrome and other problems, allowing them to enhance their sporting abilities. Another important objective was to maintain and preserve the natural ecological balance and beauty ofthe Kings Park precinct, by creating an architecture which is responsive and integrated into the chosen sites conditions. It is for this reason that new technologies, concepts and theories were explored in order to create an environmentally sustainable intervention in which the buildings 'performance' between user and surrounding context becomes a generator for the architecture. This was done in order to create, a more meaningful architecture which expresses the 'DNA' of the building while relating to the users and surrounding environment.

The second part of the final objective was to determine the functional requirements of the proposed HPC. This was facilitated through the investigation of precedents and most importantly by acquiring primary information by visiting local case studies. These studies ultimately became an important guide/reference to the proposal; helping to inform a schedule of accommodation and brief for a Durban based HPC.

8.3 CONCLUSIONS

Throughout this dissertation document the research has explored the three primary research objectives and hypothesis in order to resolve the identified research problems (page 5). The research began from a broad context and proceeded toward the specific, namely the 'Social', 'Urban' and 'Architectural' aspects, in order to achieve a holistic design approach. It investigated the significance of sport in society and its influence on the urban fabric and architecture.

The findings responded to the hypothesis by determining, *'an appropriate architectural/urban design intervention for Durban, in order to harness South Africa's sporting talent, uplift an area of 'lost space' and create a meaningful architectural response'.*

Ultimately, the information gleaned from this research document derived a brief, schedule of accommodation, urban design objectives and appropriate site for the intervention. These aim to directly facilitate in the successful design of an urban framework and High Performance Centre for the Kings Park Precinct, Durban.

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DESIGN REPORT

SPORT AS A GENERATOR FOR NATION BUILDING, URBAN REVITALISATION AND A MEANINGFUL ARCHITECTURE:

TOWARDS THE DESIGN OF AN URBAN FRAMEWORK AND HIGH PERFORMANCE CENTRE FOR THE KINGS PARK PRECINCT, DURBAN.

RYAN HARBORTH

NOVEMBER 2010

ABSTRACT

The purpose of this thesis is to explore the significance of sport in society and its influence on the urban fabric and architecture. The project investigates the relationship between the built form and sport in the design of an urban framework and High Performance Centre for Kings Park, Durban.

INTRODUCTION

The research hypothesis was, **"to determine an appropriate architectural/urban design intervention for Durban, in order to harness South Africa's sporting talent and uplift an area of 'lost space' through the creation of a meaningful architectural response".**

Architect Richard Rogers believes that, *"If we can fuse social and urban concerns, technological innovation, and environmentally responsive design, this will create an architecture which reflects the requirements of the 21st century"* (Gissen, 2002: 173).

It is for this reason that the research progression begins with social concerns narrowing to urban issues and finally focuses on architectural matters. The three primary research objectives and hypothesis have been formulated to resolve the three identified research problems and generate a relevant architectural and urban design intervention.

Social

Problem: Sports has a significant role to play as a catalyst for social change in South Africa. However **SA has not been able to develop all sporting codes to their true potential due to the inequalities of apartheid politics and the subsequent international sports boycott. This was most evident at the 2008 Beijing Olympics; SA's worst showing in the history of the games.** Research shows that with sporting success comes increased unity and patriotism encouraging a sense of togetherness and building a stronger national identity.

Objective: The superior performances of the modern-day athlete are the product of a complex interaction of physiological, biomechanical, nutritional and psychological factors. In order for an athlete to reach his/her full athletic potential, it has become common place for countries to establish High Performance Centres (HPC's) to utilize scientifically proven principles, rather than trial and error. **Professor Tim Noaks noted that countries which are not competitive in the sports sciences, will ultimately become non-competitive in the international arena. KwaZulu-Natal is one of South Africa's major provinces yet to develop a HPC, it was therefore deduced that an HPC for KwaZulu-Natal would be the most appropriate architectural typology to successfully harness South Africa's sporting talent.** The proposed HPC would best be sited in the Kings Park Precinct, Durban. This was consistent with past proposals and case studies, which were all located within

established sporting precincts. This would **maximise use of, and support existing infrastructure and facilities, thus creating a symbiotic relationship between functions and complementing the Kings park complex.**

Urban

Problem: **Due to the Kings Park precincts poor planning past, facilities and services have located themselves in an ad-hoc fashion, resulting in isolated land parcels without cohesion with the surrounding urban fabric. This underdeveloped and underutilized tract of land, does not contribute to the city on a daily basis, and ultimately creates 'lost space' within the city.**

Objective: The second objective proposes to **use the sports event 2020 Olympic Games as a means of generating an urban intervention which uplifts this area of 'lost space'.** This will further establish Durban as 'the sporting capital of Africa'. The goal will be to create a framework that highlights the uniqueness of the region whilst benefiting the users of the city well beyond the requirements of the Olympic bid.

Architectural

Problem: Architect and author, David Leatherbarrow notes that the current tendency in architecture is to separate identity and function, which has divided the interaction between the building, the user, and the environment.

Objective: The final objective therefore focuses on identifying an appropriate and meaningful architecture which expresses the **DNA of the building while relating to the users and surrounding environment.**

It can therefore be seen that the above objectives have guided the project toward the design of an urban framework and High Performance Centre for the Kings Park Precinct, Durban.

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1. BRIEF

1.1. Client

The Strategic Developments division of Durban's City Council have identified the need for a High Performance Facility within the Kings Park Precinct, Durban. This idea has been put into action through the releasing of a Consultants Brief whereby interested parties were advised to submit business proposals surrounding the development of the HPC (eThekwini Municipality, 2006).

The client would be similar to that of the SSISA in Cape Town. A partnership between the Sports Science Institute of South Africa and the University of KwaZulu-Natal would be most appropriate. Spaces within the facility would then be sublet to companies such as Discovery Health, Virgin Active and Adidas.

1.2. Client Objectives

The primary objective is the successful design of a High Performance Centre for the Kings Park Sport Precinct, Durban.

The role of the centre is to enrich the regional and national sporting community by providing easy access to medical and scientific professionals within sport. The centre should incorporate all the necessary components needed to **optimise and rehabilitate sports people, on both an amateur and professional level.** It should cater for the identification of sporting potential at grass roots level. This **talent is then nurtured and optimized by scientifically analysed methods and information systems to unlock exceptional performance from potential star athletes.**

The HPC will prove critical in attracting international athletes to Durban during their 'off' or winter season; as well as improving local athletes performance, preventing the athletic talent drain to Pretoria and Cape Town, as top KZN athletes are being poached with promises of improved chances of making national teams (Morgan, 2004: 1 & Osler, 2007: 1).

The facility should create a critical mass of intellectuals and sporting professionals in order to create an efficient environment for the education, research and development relating to sport in South Africa.

The combined efforts of the HPC would further the advancement of South African sport, harnessing South Africa's sporting talent and thereby improving its sporting prowess.

1.3. Funding

The funding will be generated in a variety of ways mainly through public and corporate initiatives; these include: renting of space by practitioners, income generated through the UKZN tertiary education component, the hotel accommodation, restaurant, conference/auditorium facilities and gym. Other means of funding may include sponsorship and advertising.

1.4. Users

- Professional athletes of international, national, provincial, club and school structure.
- Sports people aiming to improve their performance times or scores.
- The general public aiming to improve their health, fitness and wellbeing.
- Patients requiring rehabilitation or prevention of sporting injuries.
- Professionals in the fields of sport science, sport medicine and coaching.
- Students and lecturers of the tertiary education component.
- Coaches in training.
- Developing talented athletes.
- Other users may include the general public using the sports hall, conference and auditorium facilities
- Users of the surrounding urban spaces.

1.5. Building Requirements

1. Social Requirements

- The HPC will create jobs, not only in the facility but the sporting community as a whole.
- The environment shall be one that **promotes interaction across sporting codes.**
- Facilities shall be provided which benefit and cater to the broad spectrum of the community.
- The centre shall be **fully accessible to wheelchair users**. Special changing rooms need to be present for the disabled using the swimming pool, exercise area and gymnasium. Elevators or ramps should be supplemented where changes in floor levels occur. The auditorium needs to be accessible to wheel chair users, both spectators and lecturers alike.
- There should be a definite **'social heart'** to the facility.

2. Economic Requirements

- Appropriate spaces should be adaptable and **flexible** to allow for a greater diversity of uses.
- Majority of the building components, ie: furniture and fittings shall be **manufactured locally.**
- Running costs and long term maintenance must be taken into account when selecting construction systems and building materials.
- **Advertising** should be considered as a means of generating income.

3. Environmental Requirements

As a whole the building should aim to create a low carbon footprint, it should **tap into the chosen sites potential** to explore means of reducing energy and water consumption as well as waste.

The built form and operational systems should be configured as low-energy systems whilst **improving internal health and comfort conditions**. The building should benefit from passive ventilation which is essential for Durban's hot, humid, sub-tropical climate. However efficient mechanical systems will have to supplement cooling during the summer months.

An important objective to the design will be to **maintain and preserve the natural ecological balance in the Kings Park precinct**, as it is one of Durban's few remaining green open spaces near the heart of the city.

Other environmental strategies may include:

- Integrating relevant technologies to harness potential energy.
- Use of materials which have a low embodied energy and are non-toxic.
- All water should be collected for recycling.
- Conserving water by planting indigenous vegetation.

4. Design Requirements:

- The HPC should create a **symbiotic relationship between surrounding facilities.**
- **The architectural aesthetic should be relevant to the local context and the building typology. Expressing the facilities ethos within the architecture.**

1.6. Urban Design Goals

To create an urban framework for the Kings Park Precinct which will facilitate in the hosting of the 2020 Olympic Games. This framework should resolve the problems of the region, enhance the positive features of the precinct and benefit the people of the city, long after the event has ended. The urban solution should be socially, environmentally and economically sustainable, whilst establishing Durban as the sporting capital of Africa. The urban proposal should utilise the ideas discussed in the urban design theories.

2. SCHEDULE OF ACCOMMODATION

Required spaces and facilities were drawn from the client/user requirements and local precedents (The TUKS HPC & The South Science institute of South Africa).

Barker's (2008) 'Sports Halls: Sizes and Layouts' & Neufert's (2000) 'Architectural Data' both served to determine certain room sizes.

The numbers of ablutions were calculated using the National Building Regulations 0400 and parking requirement was based on the SSISA's parking ratio.

	Facility	Area m²	No.	Total m²	Spatial Requirements
1.	**Entrance/Reception:**				
	Entrance Foyer / Waiting Area	90	1	90	Open and Inviting.
	Reception/Information	22	1	22	
				112	
2.	**Administration section:**				
	General Manager	18	1	18	
	Talent Identification Offices	40	1	40	Can be Shared
				58	
3.	**Gymnasium facilities:**				
	Entrance Foyer / Waiting Area	100	1	100	Open and Inviting.
	Gymnasium Office/Reception	47	1	47	
	Gymnasium	575	1	575	Card/Turnstile Access, Link to Sports Hall
	Exercise Room	48	1	48	Specialised Timber Flooring
	Spinning Room	43	1	43	
	Stroke Pool	465	1	465	5 Lanes, Wave Reducing Edge, 25m x 12,7m.
	Pool Store	14	1	14	5 Lanes, Wave Reducing Edge, 25m x 12,7m.
	Female Showers, Change Rooms, WC and Sauna	100	1	100	Maze Type Entrance, No doors. Includes Lockers.
	Male Showers, Change Rooms, WC and Sauna	105	1	105	Maze Type Entrance, No doors. Includes Lockers.
				1497	
4.	**Sport Science Component (Tertiary education):**				
	Reception and Waiting	100	1	100	
	UKZN Staff Offices	14	9	126	
	Boardroom	37	1	37	15 People.
	Computer LAN with Office	150	1	150	
	Classrooms	67	3	201	
	A/V Editing and Analysis Rooms	28	1	28	
	Biochemistry Laboratory	110	1	110	
	Biochemistry Store	10	1	10	
	Bicycle and Treadmill Laboratories	112	1	112	2 Bicycle, 2 Treadmill and 1 Data Room

	Facility	Area m²	No.	Total m²	Spatial Requirements	
	Bio-mechanics Laboratory	100	1	100	Access to Sports Hall and Gym	
	Bio-mechanics Store	14	1	14		
	Environmental and Metabolic Chambers	80	1	80	Sealed Rooms	
	Data Room	17	1	17	Attached to Environmental and Metabolic Chambers.	
	Visual Performance Skills	20	1	20	Eye-Gym : Dark Room with Specialised Equipment.	
	Staff Lounge	65	1	65		
	Kitchenette	18	1	18		
	Student Lounge	47	1	47		
	Female Change Rooms, WC	38	1	38		
	Male Change Rooms, WC	38	1	38		
				1311		
5.	**Sports Medicine facilities:**					
	Reception and Waiting	120	1	120	Include Cold Room and Dispensary.	
	Physiotherapy : Consultation Rooms	13	4	52	Access to Physio Multipurpose Space and Sports Hall.	
	Multipurpose Space	165	1	165	Include Storage and Reception	
	Bio kinetics: Consultation Rooms	14	3	42	Access to Sports Hall and Rehabilitation Gym	
	Rehabilitation Gym	123	1	123	Include Storage	
	Nutritionist and Weight Loss: Consultation Rooms	13	2	26		
	Sport / Health Psychology: Consultation Rooms	20	2	40		
	Sports Doctors: Consultation Rooms	20	2	40		
	Orthopaedics: Consultation Rooms	21	2	42		
	Radiology and Ultrasound Room with Office	30	1	30		
	Boardroom	37	1	37		
	Staff Lounge	65	1	65		
	Kitchenette	15	1	15		
	Female Change Rooms, WC	38	1	38		
	Male Change Rooms, WC	38	1	38		
	Store Room	8	1	8		
				881		

	Facility	Area m²	No.	Total m²	Spatial Requirements
6.	**Multi-Use Sports Hall**				
	Hall	1000	1	1000	Flexible. Linked to 40m sprint track. Specialised flooring. Stack Seating. Min 7.5m Volume
	Store	45	1	45	Accessed from Sports Hall
				1045	
7.	**Auditorium / Conference Facilities**				
	Auditorium	208	1	208	160 Seats including areas for disabled users
	Projector Room	8	1	8	
	Conference Rooms	65	2	130	Flexible
	Conference Storeroom	20	1	20	
				366	
8.	**Training Academy:**				
	Teaching Spaces/ Seminar Spaces	70	3	210	Access to Surrounding Sporting Facilities
	Store Room for Equipment	85	1	85	Access from Surrounding Sporting Facilities
	Kayak Store Room	85	1	85	Access to Waterway
				380	
9.	**Accommodation:**				
	Boutique hotel: Rooms with En-suite Bathrooms	25	18	450	Maximise Potential Views
	Boutique hotel: Paraplegic Rooms with En-suite Bathrooms	35	2	70	Maximise Potential Views
	Boutique hotel: Common Area	53	2	106	Lounge Style Seating
	Boardroom	44	1	44	
	Internet Facilities	16	1	16	
	Kitchenette	17	1	17	
				703	
10.	**Restaurant and Juice Bar:**				
	Kitchen & Juice Bar	136	1	136	
	Seating Area	450	1	450	Doubles as Staff Room, Public Facility and Student Space
				586	

	Facility	Area m²	No.	Total m²	Spatial Requirements	
11.	**Services:**					
	Security	5	1	5		
	General Store	35	1	35		
	Maintenance Workshop	35	1	35		
	Laundry	25	1	25		
	Lifts	6	3	18		
	Pool Plant Room	78	1	78		
	Chiller Plant Room	58	1	58	2 Chillers	
	Bio-Fuel Generator	22	1	22		
	Anabolic Digester	120	1	120	Retention chamber. Volume: 300 000 Litres	
	Geothermal Heat Pump	28	1	28		
	Battery Back-up	32	1	32	Include Inverter	
	Deliveries Bay	9	1	9	Near Refuse Area. Link to Kitchen	
	Refuse Area	13	1	13	Near Deliveries Bay. Back of Site. Link to Kitchen	
	Metre Room	6	1	6		
	Switch Room	6	1	6		
	Grey Water Collection Tank	116	1	116	Volume: 290 000 Litres	
	Rainwater Collection Tank	173	1	173	Volume: 467 000 Litres	
				779		
	Subtotal			**7718**		
	Circulation @ 15%			**1059**		
	Total			**8777**		

	Facility	No.	Area/m² per Bay	Total Area/m²	Spatial Requirements	
12.	**Parking**					
	Parking Bays (1 bay per 35sqm of Sub Total)	221	27	**5954**	Parking on Ground or Semi-Basement (High Water Table)	

3. FUNCTIONS WITHIN THE BUILDING:

As seen in the schedule of accommodation, the primary components of the proposed HPC include:

1. Reception/Entrance Foyer: The entrance needs to be unambiguous, readable and easy to move around. There must be easy access from the entrance foyer to the auditorium, restaurant, toilets, reception and waiting area. This space should allow users to orientate themselves to the various functions of the building.

2. Administration section: This component is needed for the general operations and management of the facility.

3. Gymnasium: The gymnasium is required to accommodate both professional athletes and a limited no of the general public, (similar to that of the SSISA) providing the necessary equipment and facilities for strength and conditioning training.

4. Sport Science Component (Tertiary education): This is the research component of the facility, investigating factors influencing physical performance and health while disseminating knowledge and skills through education. It provides a tertiary education facility for the research and teaching of all aspects of sport. The research aim is to develop an understanding of human function during exercise and to use this knowledge to:

- Promote health and well-being.
- Treat and prevent specific chronic diseases.
- Treat and prevent injuries and medical conditions associated with sport and exercise.
- Optimize exercise performance.

Spaces include A/V rooms for the analysis of athlete's movement and game analysis (both team and individual). The biochemistry laboratory is used for testing, sampling and development in a variety of different sporting applications. Some of the applications include nutrition, blood and protein testing. The biomechanics laboratory is used to analyse an athlete's body movements. It is equipped with various motion capture cameras, pressure plates and analysis systems. The bicycle and treadmill laboratories are used to analyse various physiological aspects of athletes such as fitness, oxygen usage, heart rate, blood pressure, etc.

The environmental chamber simulates the climate of almost any country in the world, allowing athletes and other individuals to experience adverse conditions and then acclimatise. Temperatures can range between 60°C and -20°C, with humidity anywhere between one and 99 per cent. The chamber can be used to:

- test clothing tolerance under different climatic conditions
- study the effects of enduring extreme environments on sports people
- look at the effects of temperature on work-related tasks in the occupational setting

The metabolic chamber is used for recording physiological reactions of athletes over a number of days. An "eye-gym" is a dark room used to analyse and develop visual performance skills. Other spaces of the sport science component include offices for staff, computer LAN's and classrooms for students, and other ancillary spaces.

This component needs access to surrounding facilities such as practice fields, athletic facilities, Olympic pools etc, as much of the analysis is conducted outside and at other sporting facilities.

5. Sports Medicine facilities: This is the service function of the facility, catering to monitoring, diagnosis, rehabilitation and treatment of sports injuries etc. This component will be available to athletes and the general public alike.

Practitioners include:

- Physiotherapists – Treatment and diagnosis of injuries to the muscular skeletal system. They maximise human movement, function and potential.
- Biokineticists – Analyse human movement and prescribes certain exercise programs for the re-habilitation and prevention of sports injuries as well determining optimal movement pattern in order to improve an athlete's performance.
- Nutritionists – Analyse and develop specific nutritional and dietary programs as per users needs, and supervise the preparation and serving of meals. They help prevent and treat illnesses by promoting healthy eating habits and suggesting diet modifications.

- Sport / Health Psychologists – Use psychological principles to improve sports performance in both team and individual environments. Health psychology applies psychological principles to behaviours and lifestyles that affect a person's physical health.

- Orthopaedic Surgeon – (consultation only) specialize in the muscles, ligaments, bones, tendons, joints and nerves. Orthopaedic surgeons use both surgical and non-surgical means to treat musculoskeletal trauma, sports injuries, degenerative diseases, infections, and congenital conditions.

These functions should have easy access to the rehabilitation gym and sports hall, as this is where practitioners conduct analysis, rehabilitation and develop training programs. Practitioners will also need access to the x-ray / ultrasound room.

6. Multi-use Sports Hall: This space should be flexible and adaptable to a variety of uses and sports. The sports hall will mainly be used by the sport science component for analysing athletes in action and general exercise. Various practitioners will also use the space for rehabilitation. The space should be arranged to accommodate a multitude of sports, therefore a flexible multi-court shall be used with slide away seating. This space should also be used by the general public, who may make a booking to utilize the facility for a friendly game, community gathering or function. The space requires high volumes (min 7.6m) and natural light, conducive to a sporting environment. It should also be able to be subdivided to allow multiple uses at the same time. This sports hall needs to be attached to a 40m sprint track in order for athletes to reach their maximum sprint speed for video and pressure analysis. This can also be used to monitor bowling performance in cricket.

7. Auditorium / Conference Facilities: These spaces shall be accessible to both the general public and the users of the centre. The secondary conference rooms must be adaptable to various audience sizes and serve as secondary spill over space for the auditorium. The auditorium must; have universal access, be acoustically sound and able to seat 150-200 persons. The Auditorium shall provide a high tech audio-visual environment focusing on comfort and ergonomics. The auditorium will be available to groups for lectures/seminars. It will also be able to screen movies and sporting footage at regular intervals for individuals and groups to enjoy.

8. Training Academy: The training academy consists of teaching and seminar spaces for group lectures. These spaces should have access to a variety of practice fields and athletic facilities. Equipment should be stored nearby for training sessions.

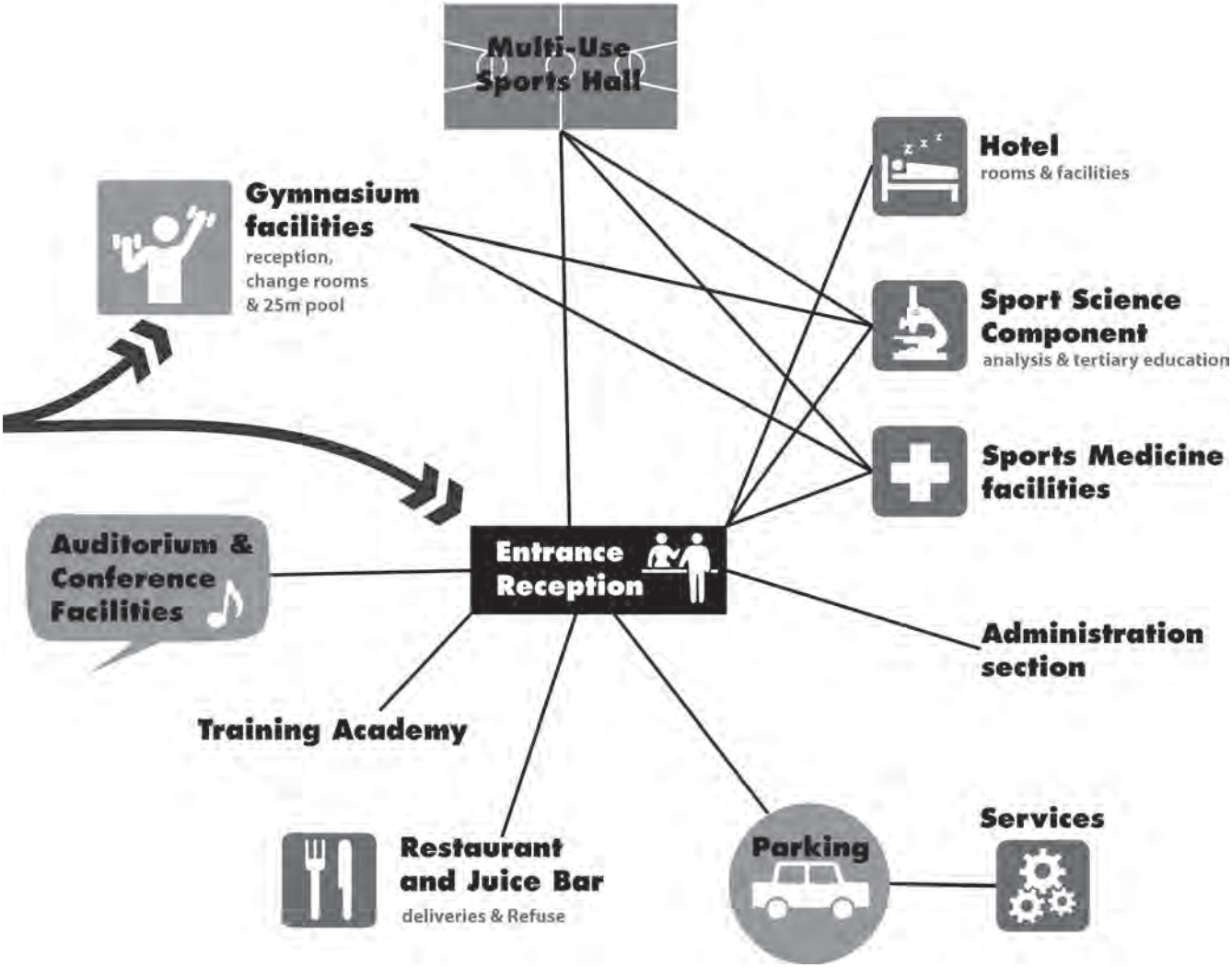
9. Accommodation: This consists of a boutique hotel component which accommodates one team at a time, with personal. There should therefore be at least 18 rooms for up to 36 people, 2 beds per room with En-suite. Common areas shall be provided for visiting teams to socialize and meet. Dormitory accommodation should be planned nearby or shuttle service provided between the university and HPC.

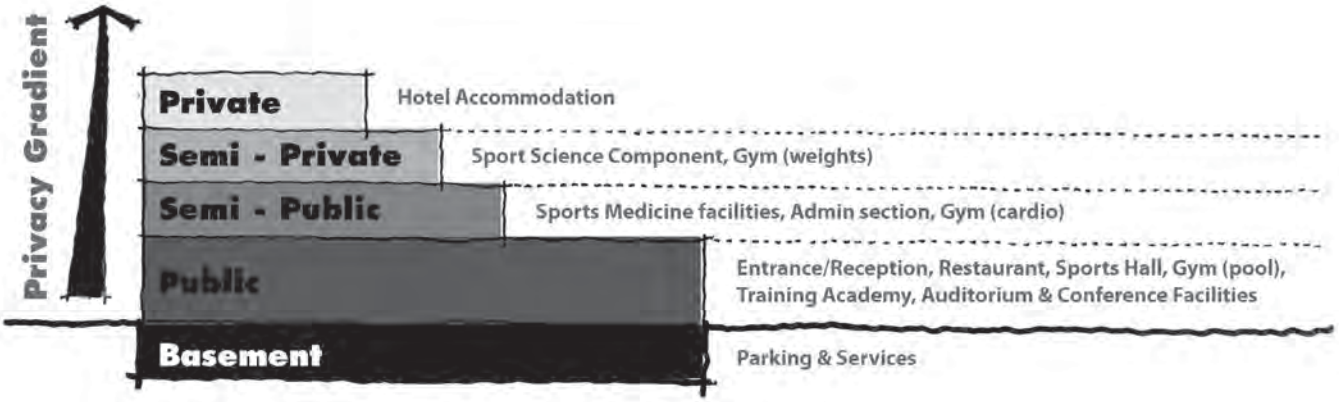
10. Restaurant, Juice Bar: The restaurant shall cater for the needs of athletes, staff (double as staff room), students and general public, providing healthy meals which could be adjusted by a nutritionist to meet individual dietary needs. This space should create a social heart to the facility, allowing the diverse users of the HPC to interact. It should be located near the entrance as a marketing objective.

11. Services: In order to service the building one requires: a maintenance workshop, general storage space, delivery and refuse area, plant and meter rooms, laundry, change rooms, lifts and a back-up generator.

12. Parking Facilities: This is limited to semi-basement or surface parking due to the high water table in the precinct. The parking facilities need to incorporate sufficient paraplegic parking bays due to the nature of the centre. Space should be provided for team/school buses, and 171 bays for staff and visitors. The number of parking needed was based on the parking area to usable floor space of the Sport Science Institute of South Africa, as the precinct and building type is similar to the proposed scheme. These facilities should be landscaped using indigenous planting and broken up into pockets, facilitating efficient pedestrian movement.

4. SPATIAL RELATIONSHIPS





5. ENVIRONMENTAL ANALYSIS

The environmental conditions of the Kings Park Precinct will be studied to in order to **harness the areas environmental and climatic potentials in both the urban and architectural interventions.**

5.1. Geotechnical:

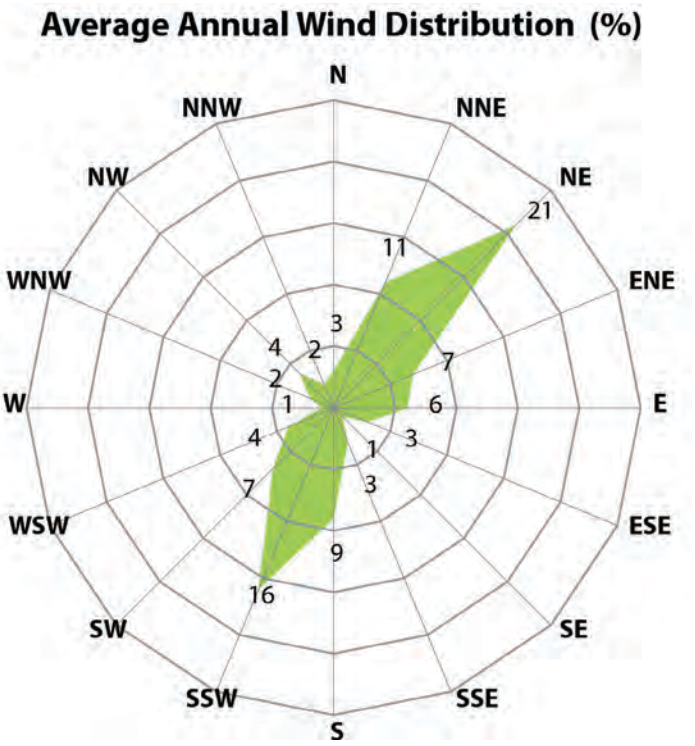
The Kings Park Precinct is composed of sandy clay harbour beds, similar to that of the CBD. Originally the area was composed of flat, low-lying, swampland which flooded periodically, as it was **part of the original course of the Umgeni River.** A large municipal drainage program of the 1920s and early 1930s claimed much of the land for development which introduced fill material to the soil .

5.2. Hydro-Geological:

Generally the soils produce a seasonal perched water table at a depth of approximately 2.5m below present ground level which fluctuate to a level of 3.8m. This would **limit subterranean development to a single or semi basement.** However the **high water table can be taken advantage of by re-introducing the Umgeni River into the area.** A one in a one hundred year flood plain lies to the north of the precinct which extends from the Umgeni River southward approximately 400m into the precinct. This **limits development within the floodplain to temporary structures or open park-like environments .**

5.3. Micro-Climate:

The Durban region is usually associated with relatively high temperatures. However due to the cooling influences of the sea breeze, the Kings Park precinct is in an area of relatively greater comfort. Durban boasts an average of **320 days of sunshine a year - great for pho-tovoltaic's**. Temperatures range from 16 to 25° C in winter and 23 to 33° C in summer. Sea temperatures are relatively stable, averaging 21° C throughout the year - **sea temp my be used as heat sink**.

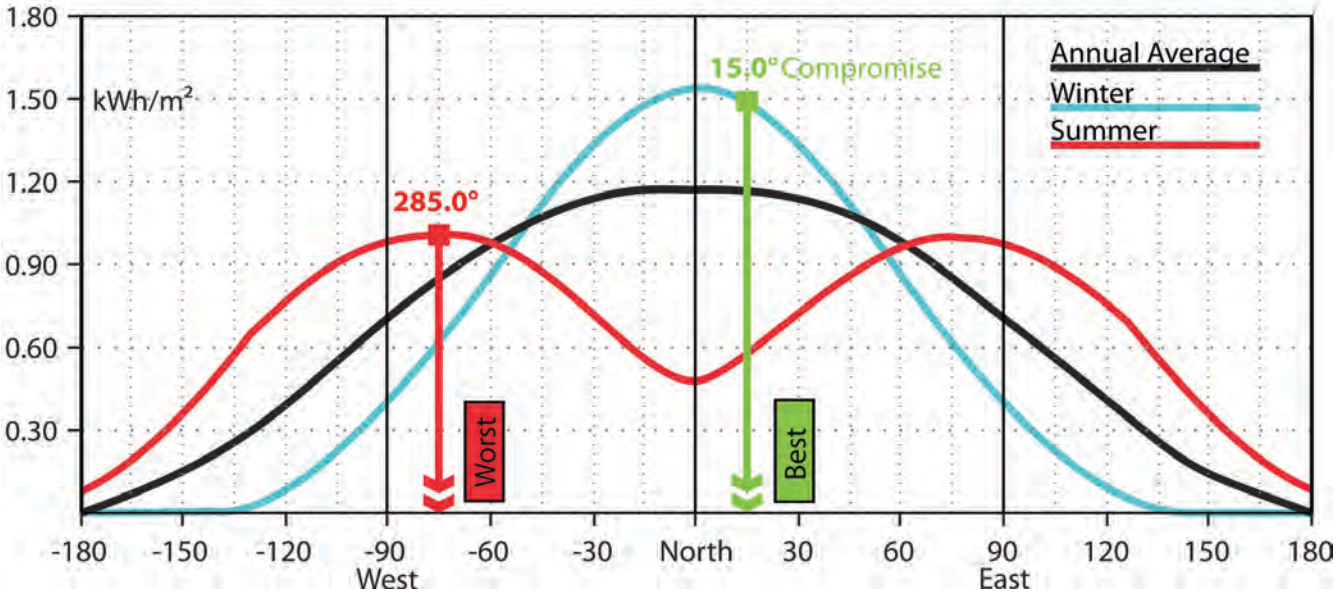


Durban has an **annual rainfall of 1,009mm which is ideal for roof gardens as they require 1000 millimetres to be self-sufficient**. The coastal regions of South Africa have higher average annual wind speeds than inland regions. Durban has a relatively consistent average wind speed of 19 Kph, perfect for **wind turbines.** The ideal orientation for a building façade in Durban is **10-20 degrees east of north**. This orientation will allow the **prevailing north-east wind to cool the building, whilst turning its back on unpleasant weather from the south-west.**

Optimum Orientation

Location: DURBAN, SOUTH AFRICA
Orientation based on average daily incident radiation on a vertical surface.

An optimum orientation is one that receives the lowest radiation during the 3 summer months and highest in the 3 winter months.

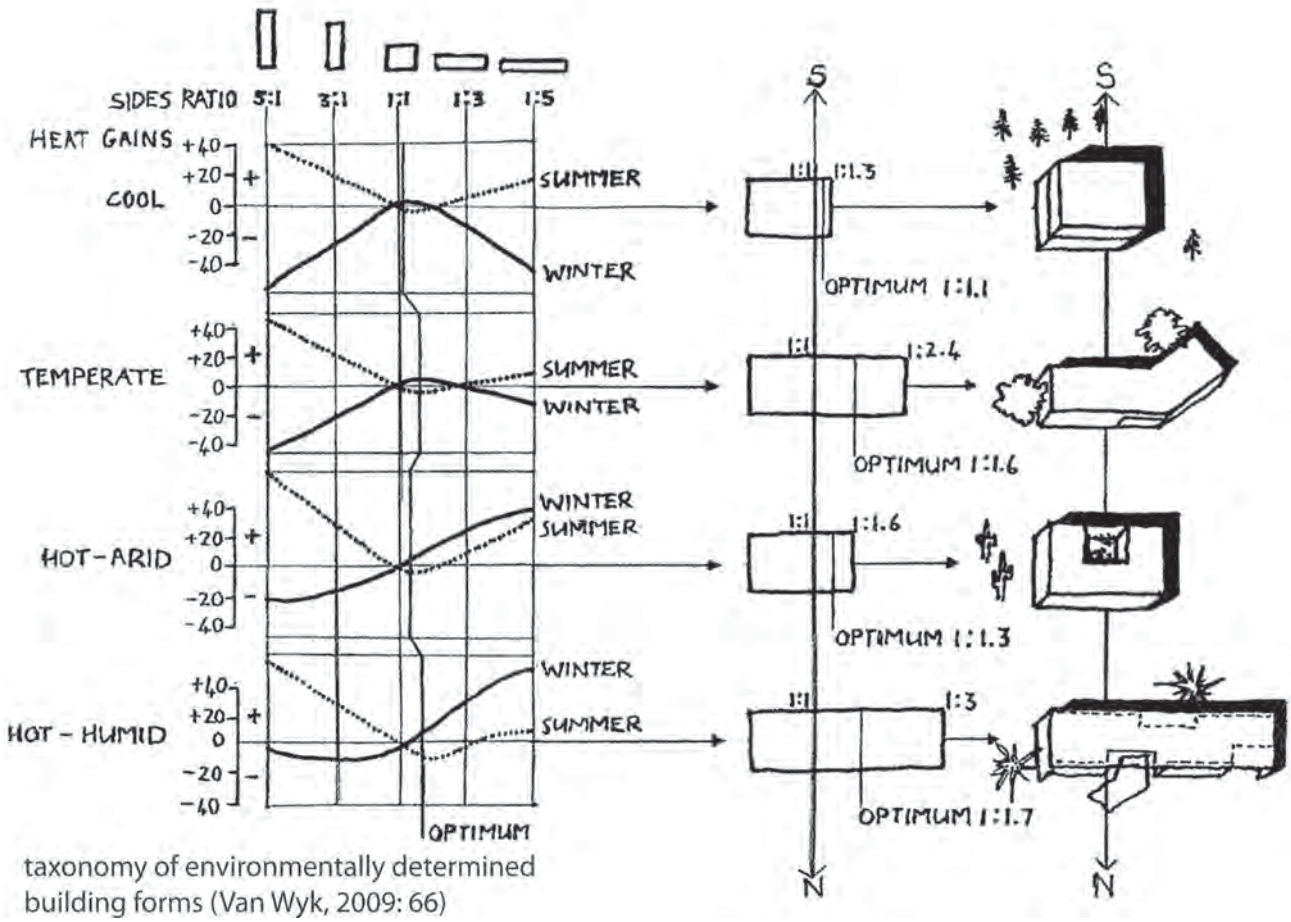


THE TABLE BELOW GIVES DESIGN GUIDELINES FOR THE FOUR MAIN CLIMATE TYPES OF THE WORLD.

	COOL REGIONS	TEMPERATE REGIONS	HOT HUMID REGIONS	HOT ARID REGIONS
adaptions	maximise warming effects of solar radiation, reduce impact of winter wind, avoid local climatic cold pockets.	maximise warming effects of sun in winter, maximise shade in summer, reduce impact of winter wind but allow air circulation in summer.	Maximise shade, maximise wind.	Maximise shade late morning and all afternoon, maximise humidity, maximise air movement in summer.
relation to water	near large body of water.	close to water but avoid costal fog.	near any water.	on lee side of water
clustering	around sun pockets.	around a common sunny terrace.	open to wind.	along east-west axis, for shade and wind.
building orientaion	northeast.	north to northeast.	north east toward prevailing wind.	north.
tree forms	deciduous trees near buildings, evergreens for wind breakers.	deciduous trees nearby on west, no evergreens near on north.	high canopy trees, deciduous trees near building.	trees overhanging roof if possible.
road orientaion	perpendicular to winter wind.	perpendicular to winter wind.	broad channel, east-west axis.	narrow east-west axis.
materials colouration	medium to dark.	medium.	light, especially on roof.	light on exposed surfaces, dark to avoid reflection.

Table 1: site orientation guidelines for the four main climate regions of the world (Van Wyk, 2009: 64)

The shape and proportions of a building will influence its thermal performance. It is for this reason that the correct ratio of the side lengths of a building for the different climatic regions must be used. The figure below illustrates the heat gains in ten thousand BTUs per day of different building shape configurations and translates this information to the optimum building proportions for different climates.



taxonomy of environmentally determined building forms (Van Wyk, 2009: 66)

As can be seen buildings within a **hot humid climate should be open planned and slender in dimension so as to benefit from the cooling effects of the wind. Climatic conditions can also be improved by planting trees and shrubs which provide shade for the buildings, reduce glare and act as a filter against noise and dirt. Vegetation also absorbs radiation and the evaporation process helps cool the air.**

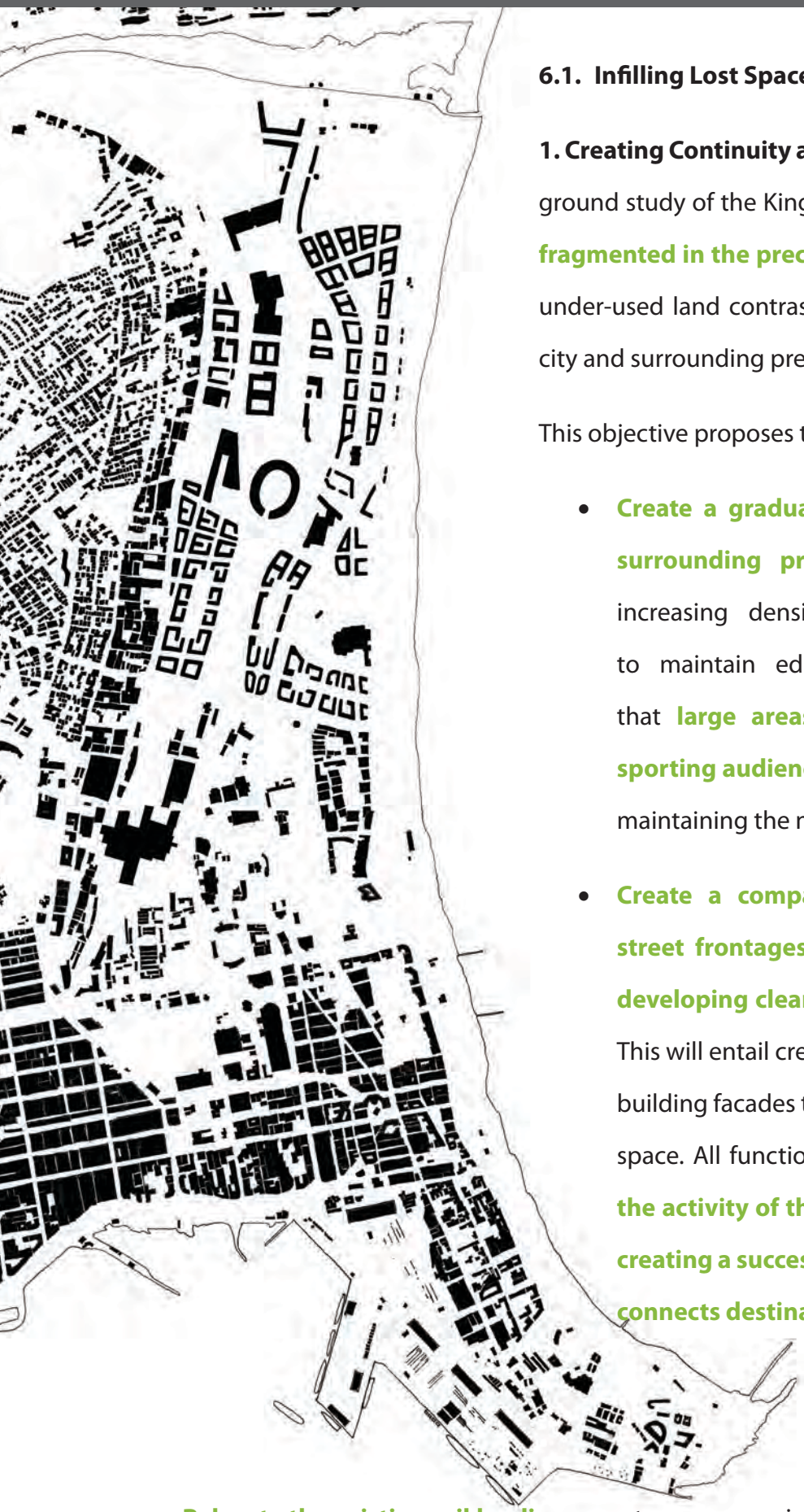
6. URBAN DESIGN CONCEPTS AND OBJECTIVES

Introduction: **Due to the Kings Park precincts poor planning past, facilities have located themselves in an ad-hoc fashion, resulting in isolated land parcels without cohesion with the surrounding urban fabric. This underdeveloped and underutilized tract of land, does not contribute to the city on a daily basis, and ultimately creates 'lost space' within the city.**

The primary urban design goal was to **use the opportunity of the 2020 Olympics as a means of generating a framework for the Precinct, in order to uplift this area of 'lost space'.** I established a series of layered concepts, similar to that of the London precedent. **The primary goal will be to highlight the uniqueness of the region whilst benefiting the users of the city well beyond the requirements of the Olympic bid**.

The established layers or objectives are as follows:

1. Infilling Lost Space.
    1.1. Creating Continuity and Enclosure (Figure Ground).
    1.2. Creating New and Enhanced Linkages.
    1.3. Creating a Sense of Place.
2. Creating a Compact Mixed-Use Development.
3. Creating a Pedestrian Orientated Precinct and Enhanced Public Realm.
4. Creating Urban Catalysts.
5. Promoting Cultural Mobility.
6. Allowing for Flexibility and Adaptability.
7. Planning a Phased Development.
8. Encouraging Environmental Sustainability.



6.1. Infilling Lost Space:

1. Creating Continuity and Enclosure: As seen in the figure ground study of the Kings Park precinct, the **urban grain is fragmented in the precinct**. The large tracks of sparse and under-used land contrast to the dense urban fabric of the city and surrounding precincts.

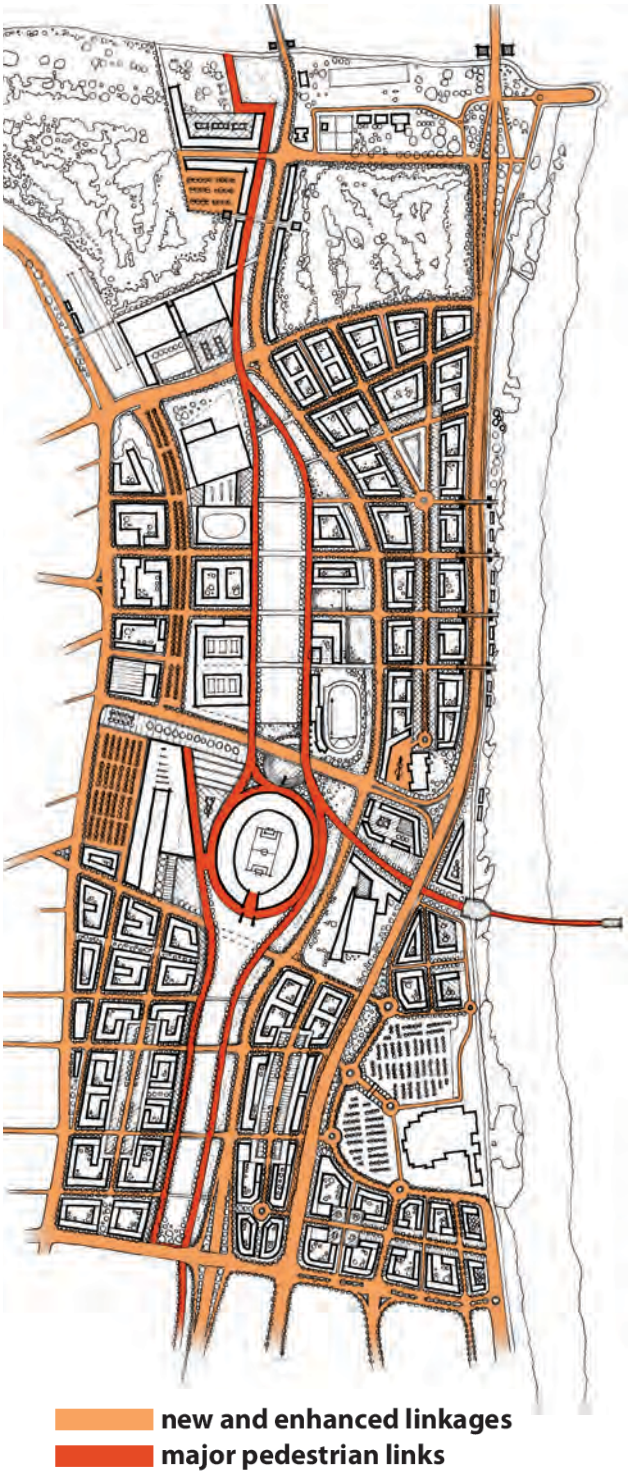
This objective proposes to:

- **Create a gradual transition between the dense surrounding precincts and Kings Park**, while increasing density of the Kings Park complex to maintain edge continuity. Bearing in mind that **large areas are needed to accommodate sporting audiences** and their movements as well as maintaining the natural park-like environment.

- **Create a compact urban fabric, continuity of street frontages and the enclosure of space by developing clearly defined public - private areas**. This will entail creating a strong urban edge by using building facades to define the street edge and public space. All functions on ground floor should **add to the activity of the precinct, which is important in creating a successful and walkable precinct which connects destinations.**

- **Relocate the existing rail loading zone** to an appropriate site in the light industrial area of Springfield. This will open up valuable land in the precinct for a mixed use development. **The compaction of the urban fabric will create an efficient city structure able to knit into the surrounding districts.**

2. Creating and Enhancing Linkages: This objective recognises the disconnected nature of the precinct and seeks to develop an urban framework that will **unify the diverse and unrelated spaces, and integrate these into the surrounding urban fabric. This will ensure that the precinct becomes a well used and active part of the city.**



This objective proposes to:

- Create new **East-West linkages to improve accessibility and avoid the harsh barriers created by the highways and railway.** These linkages will be both physical and visual, connecting Durban's residential zone to the west with the beaches and Golden Mile to the East.

- Improve the transportation networks within the region, by providing a **new intermodal transport interchange in the heart of the precinct.** This will improve local and international linkages to and from the region, encouraging people into the area and providing an additional access point to the various sporting venues.

- To **link existing and future sporting facilities** by means of **public transport, pedestrian and cycle routes** would create an enhanced sporting precinct by granting easy access to all facilities. **Access to the beachfront** will invigorate new uses for the parklands and give further opportunities for leisure by visitors and residents alike. Linkages to the beaches, Umgeni River and Harbour will be required for water sports. These linkages will encourage symbiotic relationships between facilities creating more efficient and well used facilities.

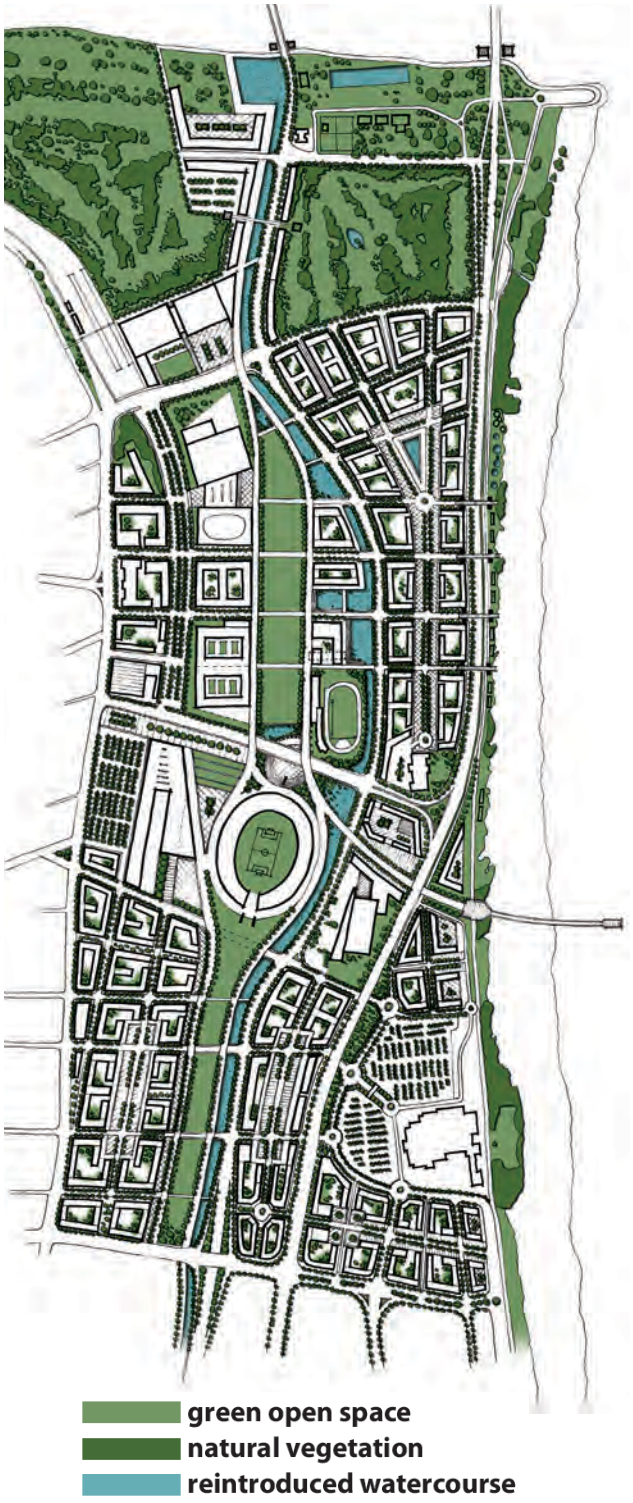
3. Creating a Sense of Place: This objective aims to **enhance the distinct character and identity of the region** in order to promote a sense of place.

This objective proposes to:

- **Maintain and enhance the precinct predominantly as a sport and recreation lung for the city** in order to build upon Durban's reputation as 'Africa's Sporting Capital'. This entails enhancing the existing sporting heart by upgrading many of the surrounding sports facilities whilst **enhancing the cultural activities of the region. These activities include the popular post event braai's and celebrations, concerts and exhibitions.**

- **Creating an entrance** to Durban at the Umgeni Bridge would generate a sense of arrival, identity and place.

- **Conserving and enhancing the surrounding natural environment of the river, harbour, beach and lush vegetation. Strategies will include; maximising views and links to the ocean, incorporating stringent greening principals into the urban design and architecture. Another strategy will take advantage of the high water table of the region by reintroducing the Umgeni River back into the city.** This would become a great asset to the adjacent developments; environmentally, aesthetically and socially. It will create opportunities for water born transport and additional recreational/sporting prospects, such as ferries, fishing or canoeing, whilst providing much needed stormwater control.

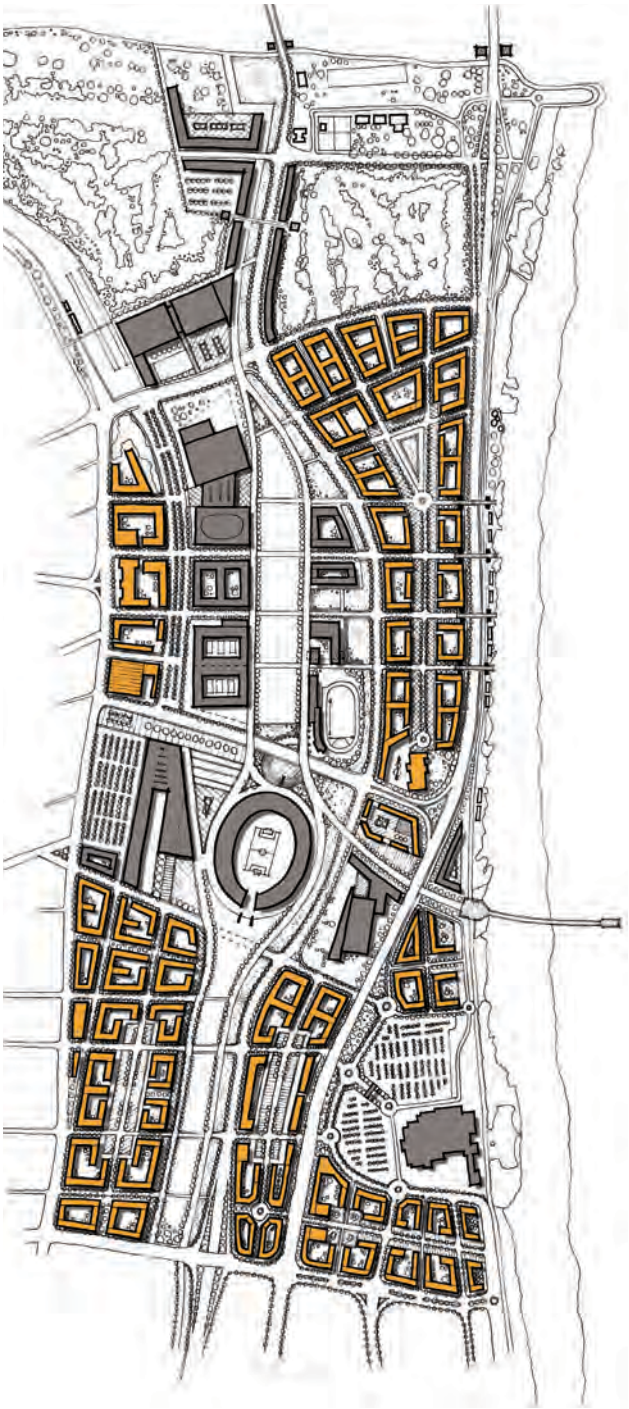


6.2. Creating a Compact Mixed- Use Development:

Currently the precinct is only well used during sports events, and the area becomes desolate during regular week days. When events are not taking place at night, the area becomes uninviting or even frightening to walk through. The area remains a sparsely developed and **underutilized part of the city.**

This objective proposes to:

- **Introduce a variety of uses**, activities and experiences: living, working, shopping and playing; all gain from being linked as opposed to being zoned separately. This will make the area **a place to be visited daily.** A mixed use development **encourages 24-hour activity** as the variety of activities take place at different times, thereby staggering the activity throughout the day. **This in turn increases surveillance and creates an environment which is active, vibrant and safe both day and night.** A compact mixed use development will create **shorter travel times** between the various components, thereby encouraging a sustainable precinct.



compact mixed use developments
other key developments which any also be multi functional

- Create a compact mixed use development to **create the critical mass necessary to avoid the stadium being treated as an isolated object; integrating the precinct and stadium as a meaningful part of the city.**

6.3. Creating a Pedestrian Orientated Precinct and Enhanced Public Realm:

This objective proposes to:

- **Provide civic uses and public places.** A city needs diversity and social life not just residential and commercial uses. The framework incorporates a transport interchange, multi functional spaces, active and passive recreation and places for a leisurely promenade. A new pier provides opportunity for ocean sports, swimming and fishing. The increased density provides opportunity for shopping streets/squares.

- **Create pleasant areas for walking, squares and plazas that are inviting spaces in which to meet, linger and stay.** This offers possibilities of meeting neighbours and co-workers and the opportunity to establish a **greater sense of community**.

- Create a **legible environment** will be achieved by creating recognizable routes, intersections and landmarks.

- **Create active street edges which engage with surrounding public spaces.** All activities on the ground floor should contribute to the liveliness of the public realm. The heights of the buildings is important, as contact with the vibrant street is lost if the buildings are too tall. However if the buildings are too low it would contribute to urban sprawl. **Buildings up to 5 stories in height** are in harmony with the way in which people move about, and how the senses function.

- **Create a rich hierarchy of spaces, from broad parklands to intimate lanes and courtyards.** The generous width of the walkways and cycle lanes prioritize the pedestrian of vehicular traffic.

6.4. Creating Urban Catalysts:

This objective proposes to:

- **Create "activity generators" or "anchors" which draw people to the precinct and increases pedestrian traffic, thereby creating a demand for secondary uses which fuel adjacent developments.** The city identified three major catalytic projects for the precinct, namely; the Moses Mabhida Stadium, future multipurpose indoor sports arena, and the High Performance Centre.

- These catalysts shall serve to **improve the appearance of the precinct by complementing the area.** Creating a series of catalytic projects for the Kings Park precinct would be a **holistic approach to revitalising and reintegrating the area into the surrounding urban fabric.** Instead of the new stadium becoming a freestanding icon. The next catalytic projects will **generate additional density, public space and surrounding activities to support it; thereby creating a successful collective space.**

identified urban catalysts

6.5. Creating Opportunity for Cultural Mobility (Fan Parks):

Forging common ground between fragmented community groups remains a major challenge in South Africa. Fan parks are new communal public spaces which facilitate "cultural mobility", i.e. places where people with different cultures and lifestyles can meet and share new experiences - spaces where a change of perception is possible.

This objective proposes to:

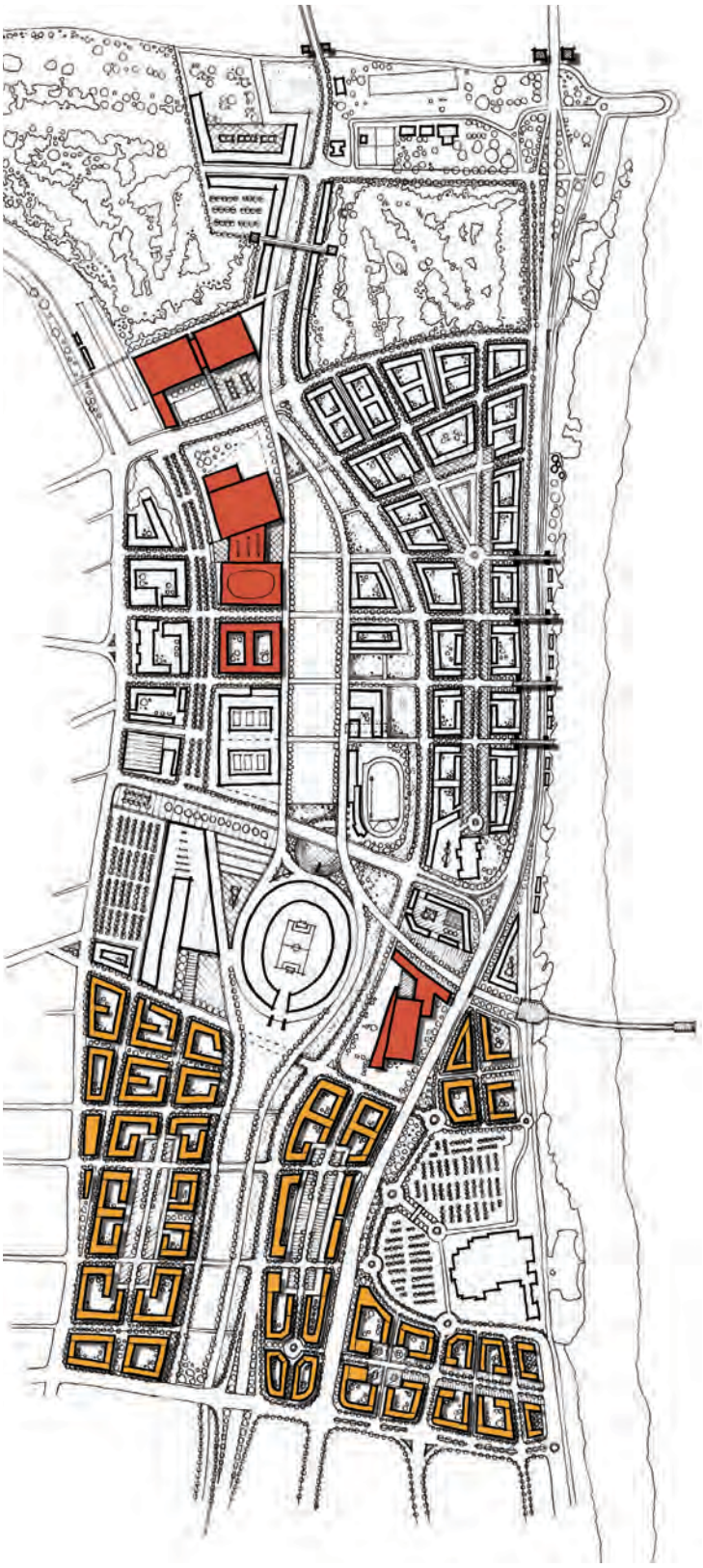
- **Establish a permanent fan park for Kings Park in order to create a public space which would accommodate many different people and lifestyles, acting as a 'cultural melting pot', encouraging social change. This would enhance the post event celebrations which are so popular within the Kings Park precinct, whilst creating spill over space around the stadium.** This space will simulate the exhilarating atmosphere found inside stadium during matches. It will essentially be a public outdoor venue **transmitting live images of games played throughout the country, providing a space for fans to watch matches at no cost; making events accessible to all.** A Fan Park responds to the needs of the people of the region in an appropriate typology for the area, whilst permanently expanding the repertoire of public space within Durban as a whole.

- **Extend the popular post-event braai's** and provide common ground between the previously separated black and white sports of soccer and rugby respectively.

6.6. Allowing for Flexibility and Adaptability:

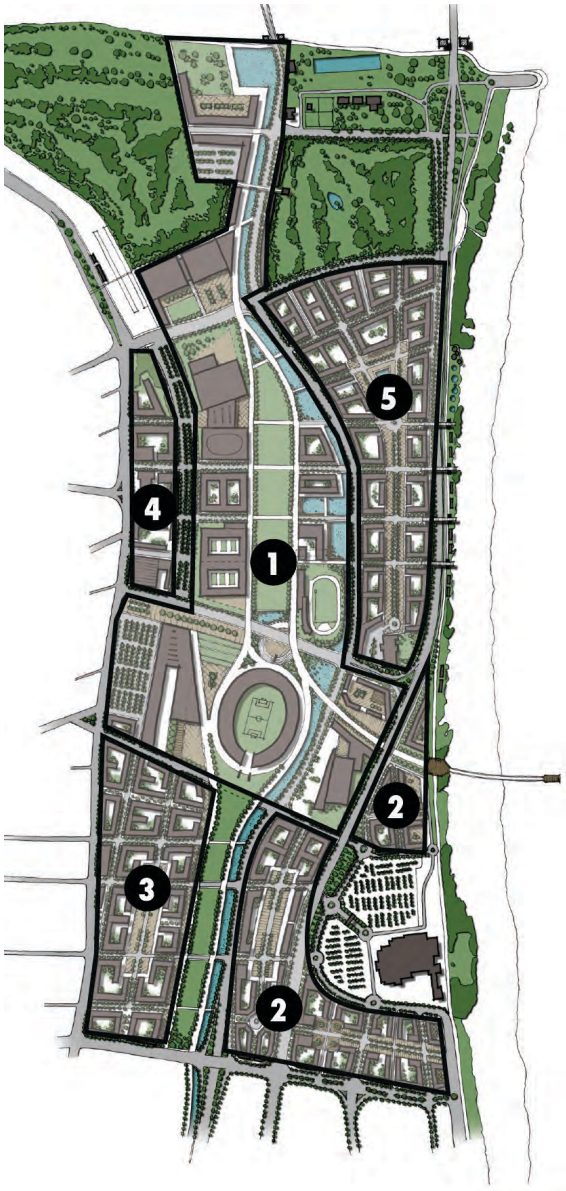
This objective proposes to:

- Promote adaptability through a development which responds to changing social, technological and economic conditions. **As the area needs to be adapted from hosting the Olympics, to an area which benefits the city on a daily basis, it was necessary to incorporate flexibility** both into the urban design and built form. A key priority of the urban framework is to ensure there would be **no 'white elephants'** once a major event had ended. Any low-intensity uses of the area should therefore be relocated, as they do not contribute to the liveliness of the public realm.



altered sports facilities after the games
olympic village converted to mixed use precinct after games

6.7. Planning for a Phased development:



This layer proposes to:

- Design the urban framework for incremental development and growth within the precinct. **Gradual transformation in urban redevelopments make interventions sustainable, giving people time to settle into the physical changes, adjust their life styles, and experiment with the new ways of using the city.** Gradual transformation allows for **greater flexibility in the design process.**

6.8. Encouraging Environmental Sustainability:

This layer proposes to **improve the Environmental frugality of the precinct.** The architecture throughout the area shall been designed to reduce energy demands, harness renewable energy sources; capture rainwater and incorporate environmentally responsible materials. To reduce waste, most existing facilities will be retained or upgraded with any demolition material being recycled.

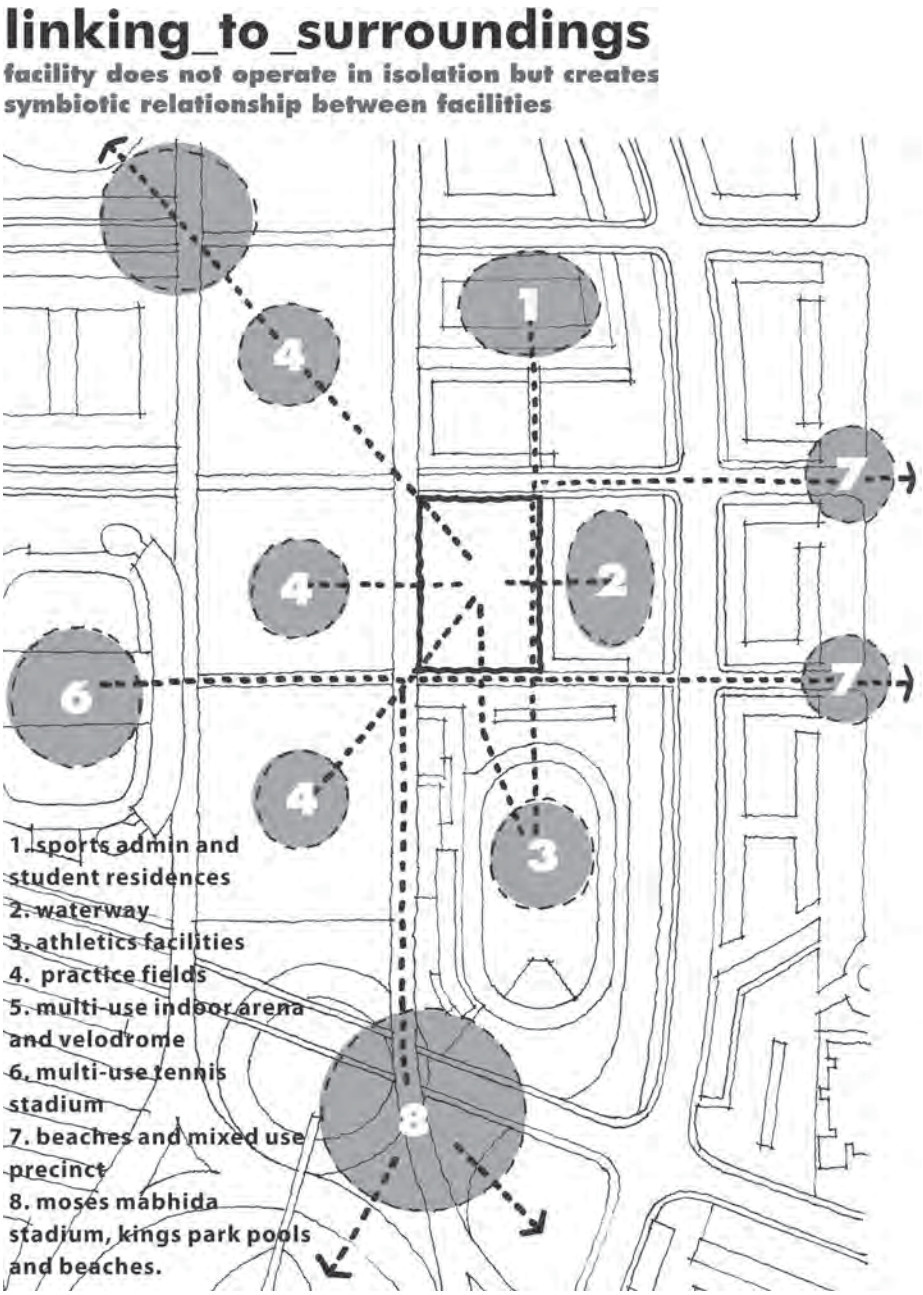
6.9. Architectural Guidlines:

A series of architectural guidelines were established to ensure the **venues produce a coherent whole,** rather than a series of arbitrary structures. This involved **using the unique spatial characteristics of the region as the concept for the architectural language.** Therefore the primary guideline will be to maintain the natural balance and beauty of the area by integrating both systematically and aesthetically with the natural landscape.

7. SITE SELECTION:

Please see the main document for more detailed site selection.

The final site was chosen due to its central location within the sporting heart of Durban. The main advantage of this is that it has excellent access to surrounding sports facilities. This is of utmost importance as a HPC does not operate in isolation. The site allows for many opportunities, such as, access to the waterway, practice fields and athletics facilities for training. It is adjacent to the multi-use fan park which allows the building to engage with this public space. It is close to the beach to cater for ocean sports and allow athletes to uses the promenade for training purposes.



8. ARCHITECTURAL CONCEPTS AND THEORIES

CREATING A MEANINGFUL AND APPROPRIATE ARCHITECTURAL RESPONSE

My architectural point of departure was to establish an appropriate & meaningful architectural response; which expresses the DNA of the building whilst relating to the users and surrounding environment.

For this I looked at Tadao Ando theory of 'transparent logic', where he notes that, "Architectural creation involves contemplating the origins and essence of the project's functional requirements and the subsequent determination of its essential issues. Only in this way can the architect manifest in the architecture the character of its origins, creating a rich and variable architecture." (Jencks, 2006: 256).

Through the consideration of the above statements, the essential issues for the design of a HPC for the Kings Park Precinct where:

1. To expose the users to a healthy environment providing them with their most precious asset – the opportunity to excel.

2. The second was to preserve the natural ecological balance of Kings Park, as it is one of Durban's few remaining green open spaces near the heart of the city.

It can therefore be seen that the built form aims to be directly informed by the user's needs and surrounding context, this will be expanded upon in the following heading in order to manifest in the architecture the character of its origins.

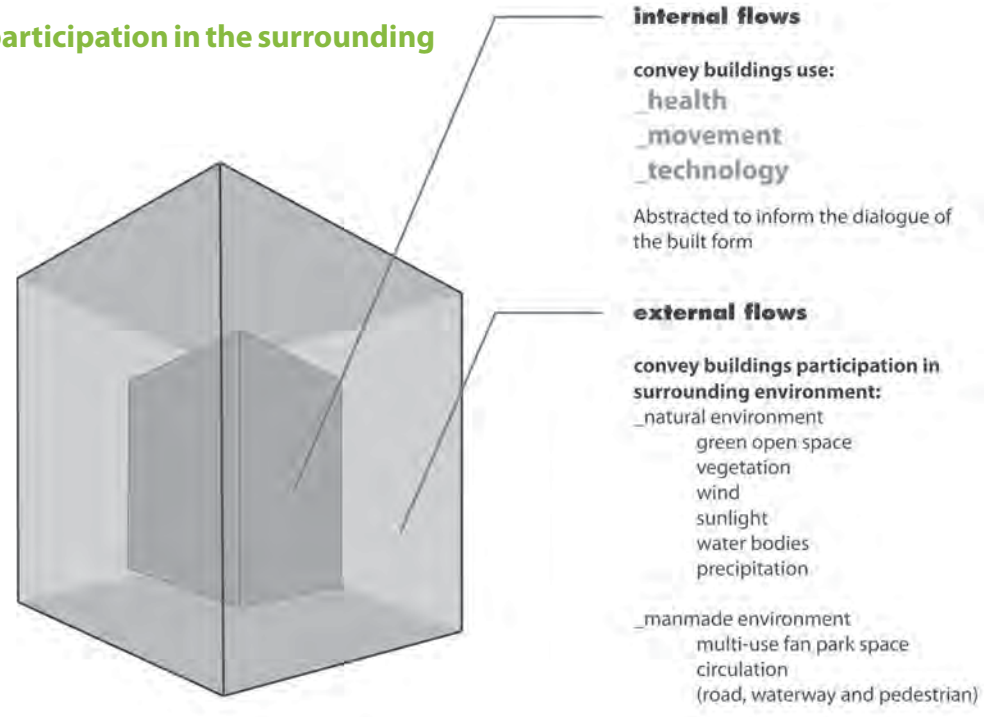
8.1. Reacting to Internal and External flows.

This concept expands on the above paradigm and revolves around expressing the DNA of the building by reacting to the internal and external flows.

The internal flows were used to convey the buildings typology. Functionally, a HPC is about using advanced technology to optimise the performance and health of the human body. **By analogy my proposal will be combined with advanced technology to optimise the health & ecological frugality of the building.** Abstract notions of **health, movement & technology** have also used to inform the dialogue of the built form.

The external flows were reactions to the context, in order to c**onvey the buildings participation in the surrounding environment.**

By using these 'flows' to generate the ultimate form and aesthetic, the building will take on additional meaning, not only engaging the user physically, but also metaphysically.



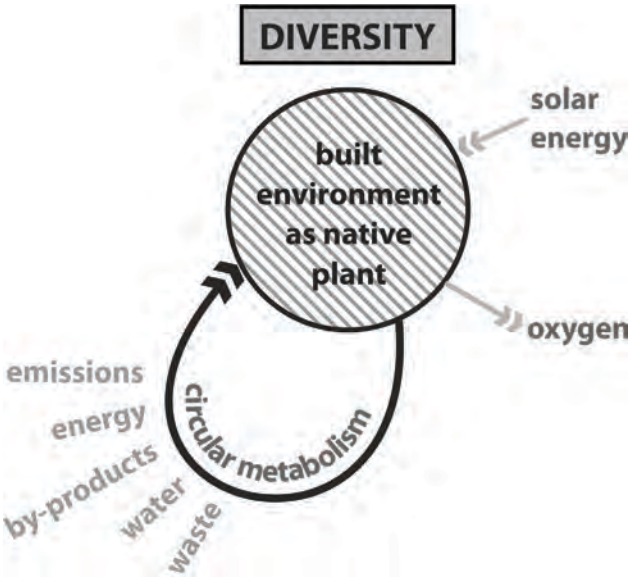
Relevant theories and concepts were explored to respond to the essential issues of creating a healthy environment for the users and preserving the natural ecological balance of the precinct.

8.2. Integrating Nature

Research proves that **regular contact with nature offers an abundance of physical and psychological benefits, and it can be argued that this relationship is crucial to an individual's health.** It is therefore in the author's opinion that it would be beneficial to synthesis the built form of the HPC with nature in order to create a healthy environment which allows the users to perform at their best. **This was achieved by creating a connection to natural elements – such as daylight, vegetation, fresh air, views to nature, and people.**

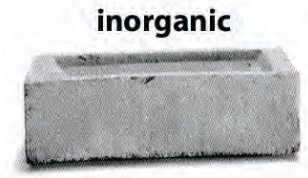
8.3. Learning from Nature

Architect **Ken Yeang** starts by looking at nature. His current work is based on **biomimesis (designing or learning by imitating nature).** He notes that ecosystems have no waste; everything is recycled. By this imitation, the built environment could reduce or eliminate waste by continuously reusing and recycling all emissions and by-products. This radical shift in attitude would **change a buildings linear metabolism to a circular metabolism**.



Yeang Notes that the earth's natural communities are extraordinarily effective in **making food from the sun, producing oxygen, filtering water and recycling nutrients and energy. They succeed, not by reproducing the same response worldwide but by fittingly elegantly into their surrounding environment.**

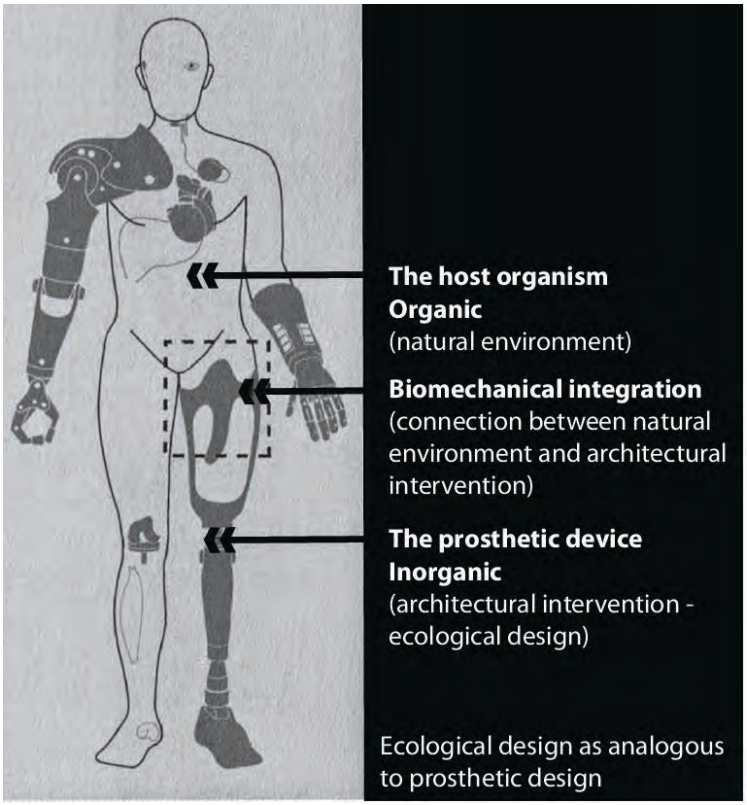
The material composition of the built environment is almost entirely inorganic, whereas ecosystems contain a complement of both inorganic and organic constituents. Yeang's view is that architects must reverse this trend by balancing the built environment with **greater levels of biomass, rectifying biodiversity and ecological connectivity in the built forms and complementing their inorganic content.**



existing built environment mostly physical (abiotic) constituents

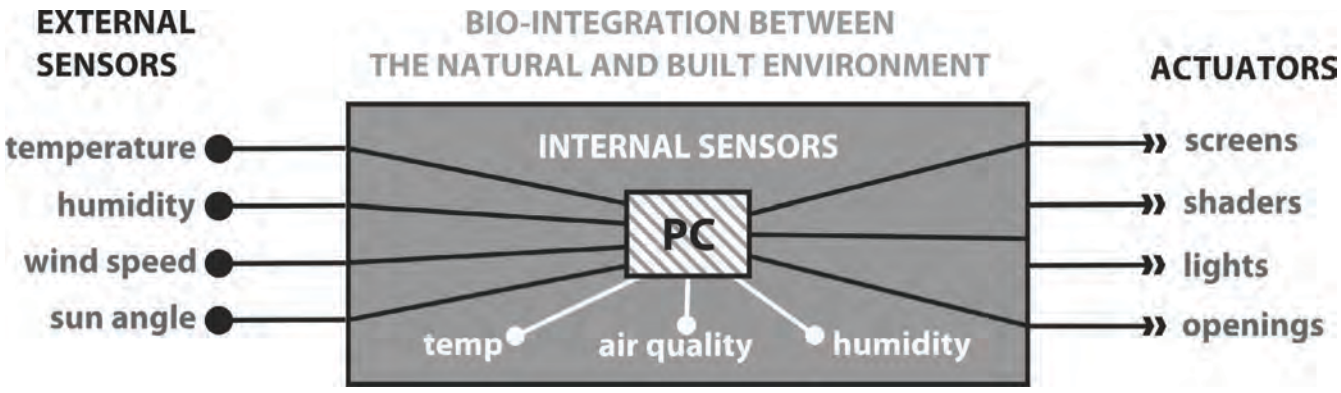
...where are the biological (biotic) constituents?

8.4. Architecture as Prosthetic to the Natural Environment



Yeang suggests that ecodesign can learn from the problems and solutions of integration encountered in prosthetics design. Prosthetics seek effective bio-integration of the artificial organ with its host human. **The design of the built environment similarly seeks effective biointegration of the artificial human-made designed system (built environment) with its host organism (natural environment).** This analogy is relevant for architects seeking solutions to the problems of the **integration of the built environment with the natural environment** as a successful ecodesign is dependent upon the effectiveness of this assimilation (Yeang, 2008: 427).

A high level of prosthetic integration would be a cochlea implant. These implants allow people who would otherwise be deaf, to hear. By analogy, the equivalents to implants can be installed into the built form by way of linked environmental sensors and activators which monitor and react to the users and surrounding ecosystem (Yeang, 2008: 430). This dynamic interaction allows for the constant changing conditions of the environment and user to ultimately control and alter the appearance and performance of the building.



8.5. Modes of Achieving Efficient Ecodesign

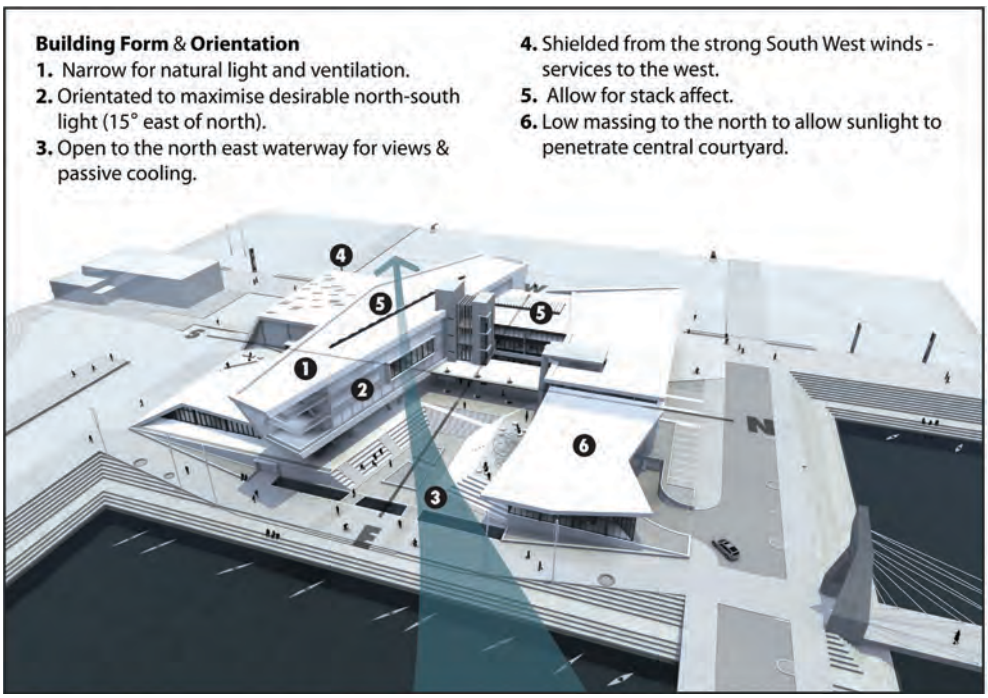
Stage1. **Maximise Passive Design Strategies**

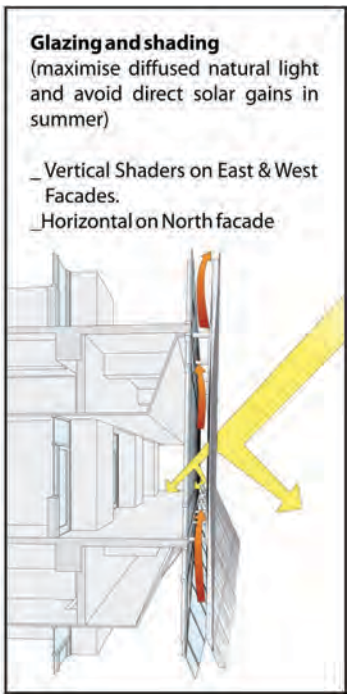
Yeang states that in order to Achieve Efficient Ecodesign all Passive Mode strategies must be maximised before proceeding to the other modes (Gissen, 2002: 177 & Yeang, 2005: 4, 5).

The first passive strategy of my proposal was to **optimise the built form and orientation.** This involved orientating the building 15 degrees east of north to maximise desirable north-south light whilst turning its back on unpleasant weather from the south-west. Opening to the north-east waterway will maximise views & passive cooling. A narrow building form which allows for the stack affect will make the most of natural light and ventilation.

The second passive strategy was **maximing the biomass within the building**. This will provide much needed solar protection, evaporative cooling, improved indoor and outdoor air quality and reduced noise levels.

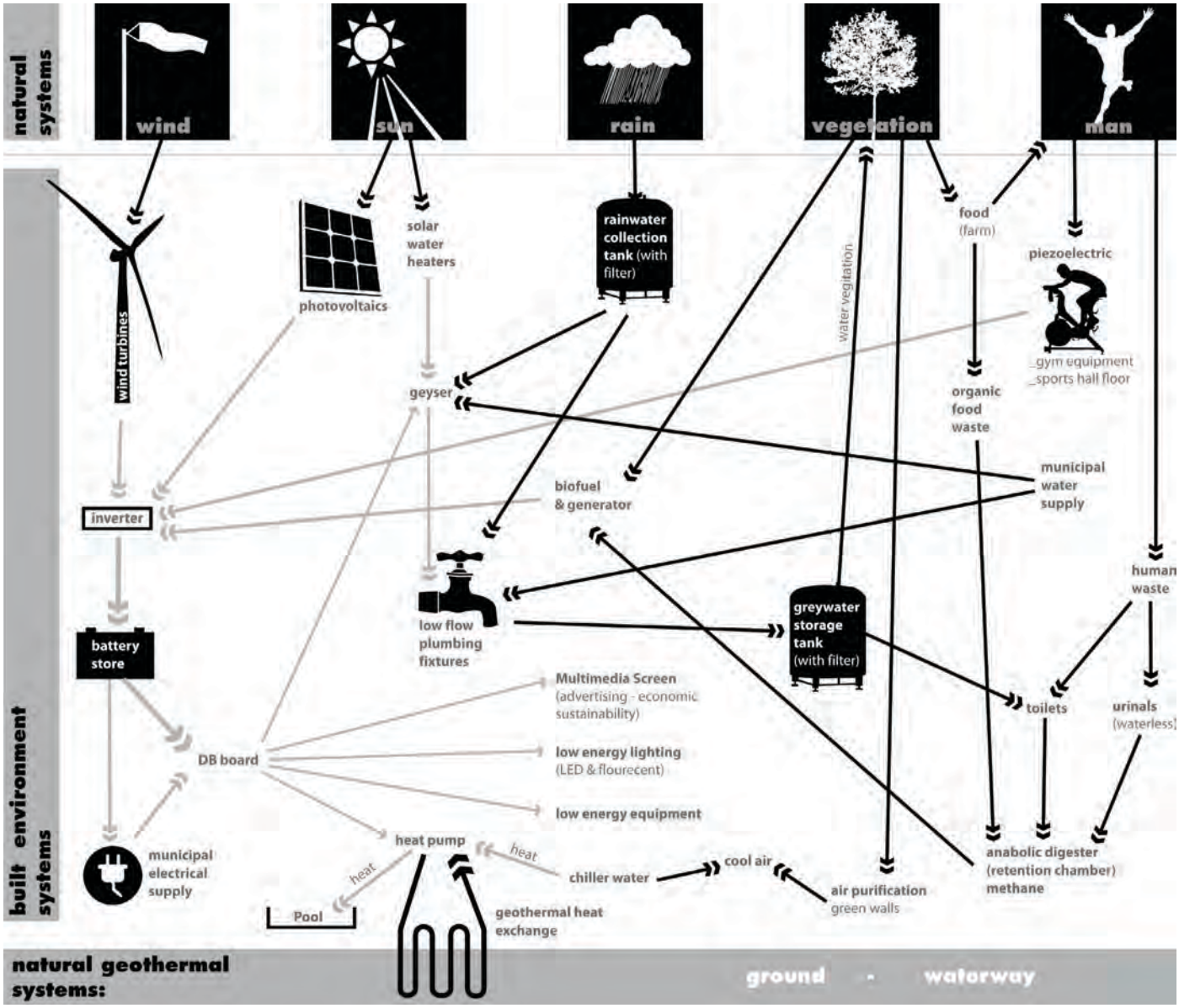
The third passive strategy was **appropriate glazing and shading** to maximise diffused natural light and avoid direct solar gains in summer.





Stage2. **Create integrated Building Systems**

Meeting contemporary expectations for comfort conditions in many climates (including Durban) **cannot be achieved by Passive Mode alone**. The internal environment often needs to be supplemented by other efficient systems. **In order to achieve efficient eco-design there must be a strong synergy between the systems of the built environment and systems of the natural environment** (Yeang, 2005: 4 - 5).

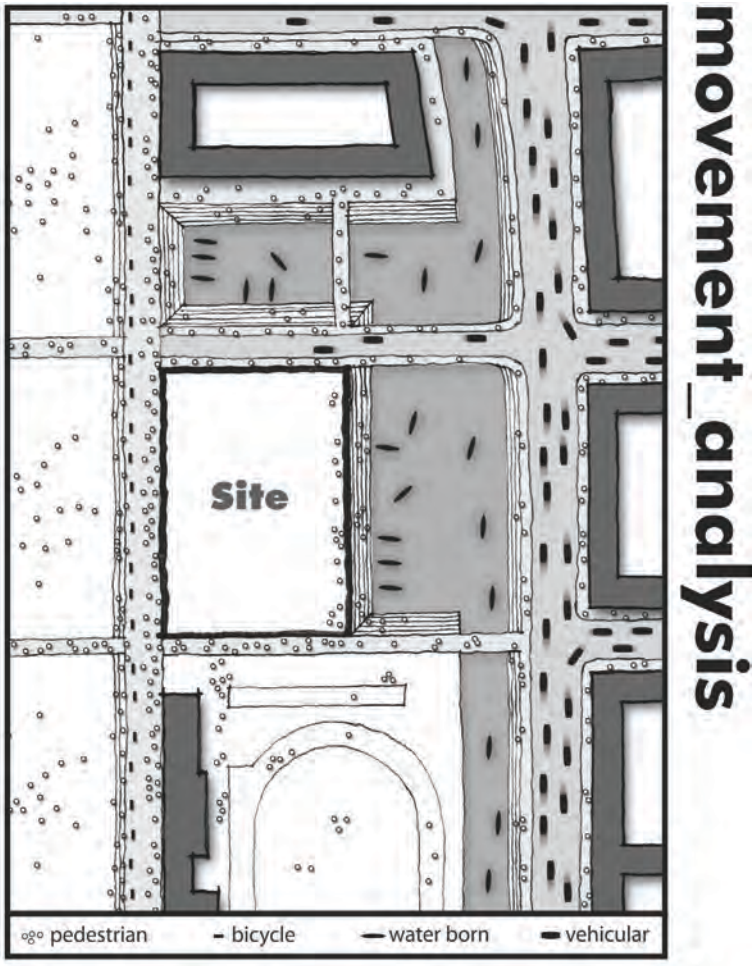


Yeang's theories suggest a radical shift from designing buildings as inanimate; one size fits all objects, to designing **buildings as life support systems embedded in the natural forces of particular places.** This type of approach generates site specific solutions, if relocated, the architecture will not only be illogical, it will be unsuccessful, as it would not achieve its **maximum performance** (Gissen, 2002: 122, 124).

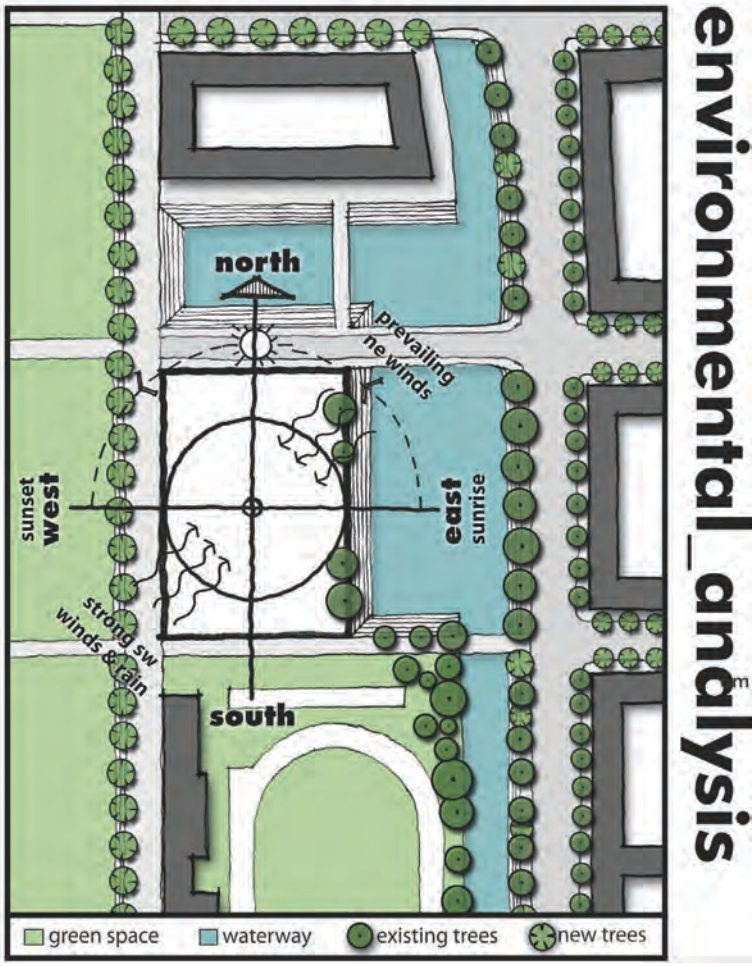
8.6. Analyses

These diagrams show various analyses of the site.

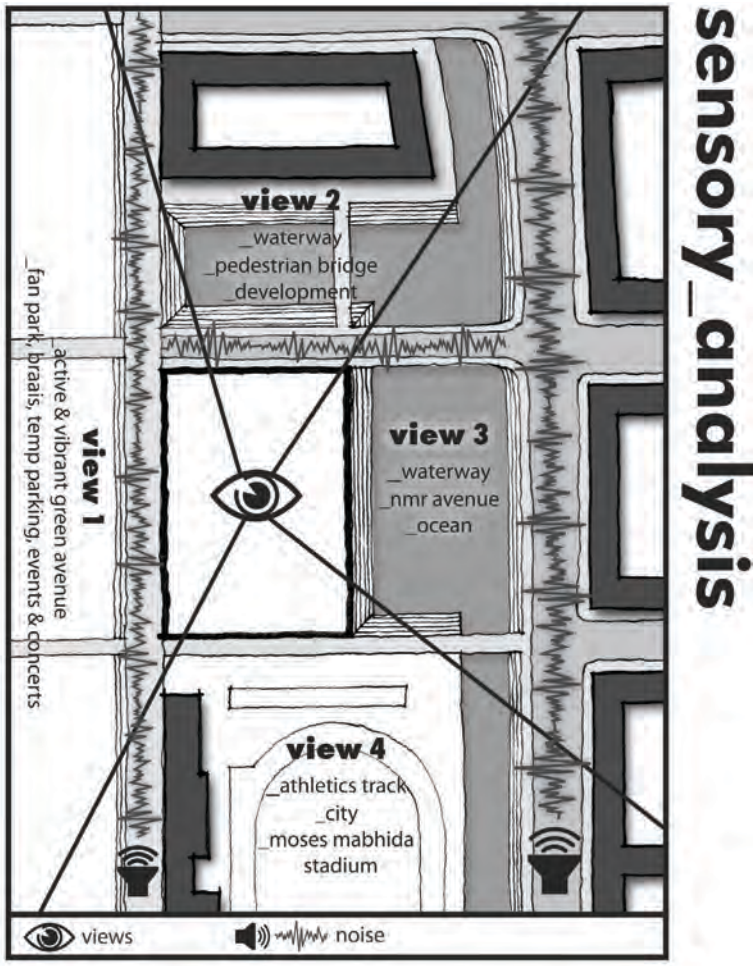
The first shows a **movement analysis** with most pedestrian activity to the west, vehicular traffic to the north and water born transport to the east.



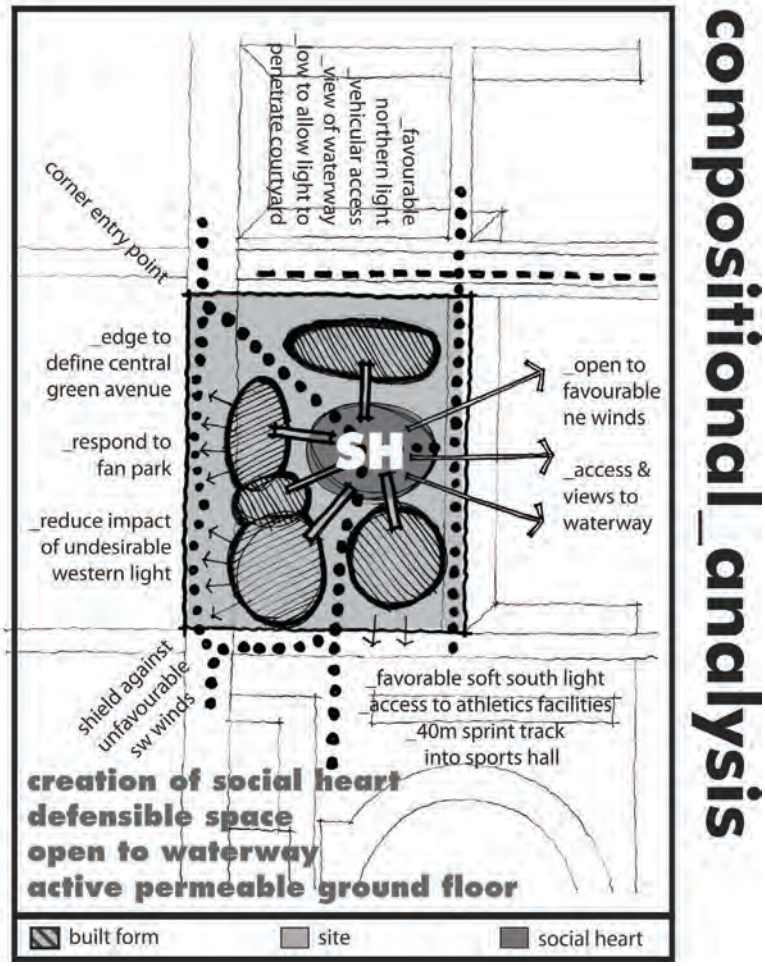
The **environmental analysis** shows existing and newly introduced trees, green open space and waterway, prevailing winds and solar orientation.



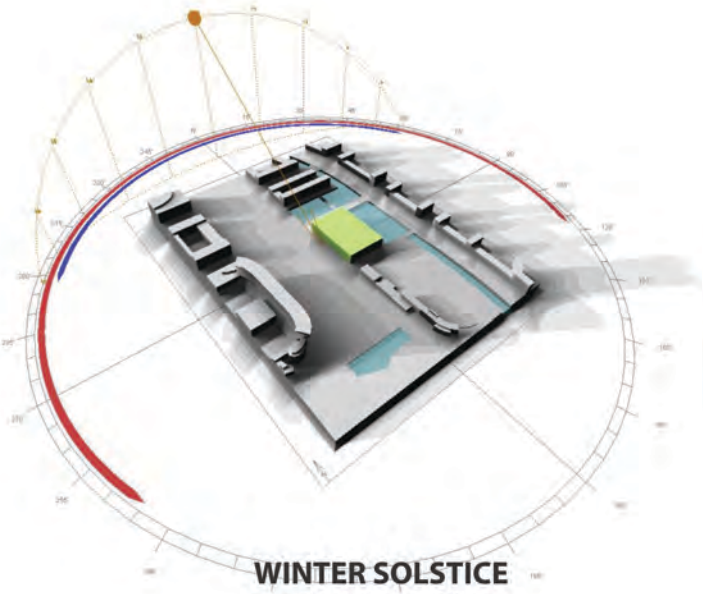
The **sensory analysis** explains the views and areas of noise around the site.



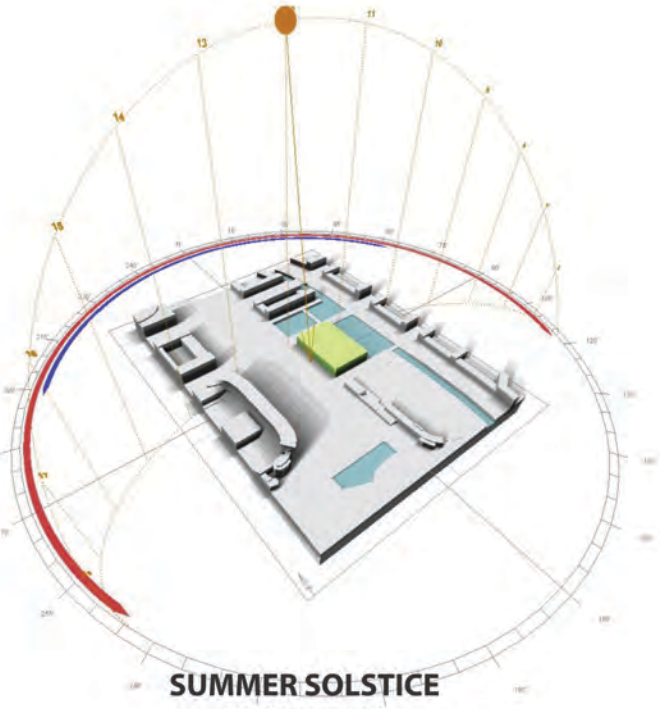
The **compositional analysis** explores how the building should respond to each unique edge of the site. It shows the need for an active permeable ground floor, with various links. An important aspect was the creation of a social heart to the facility which is open to the waterway.



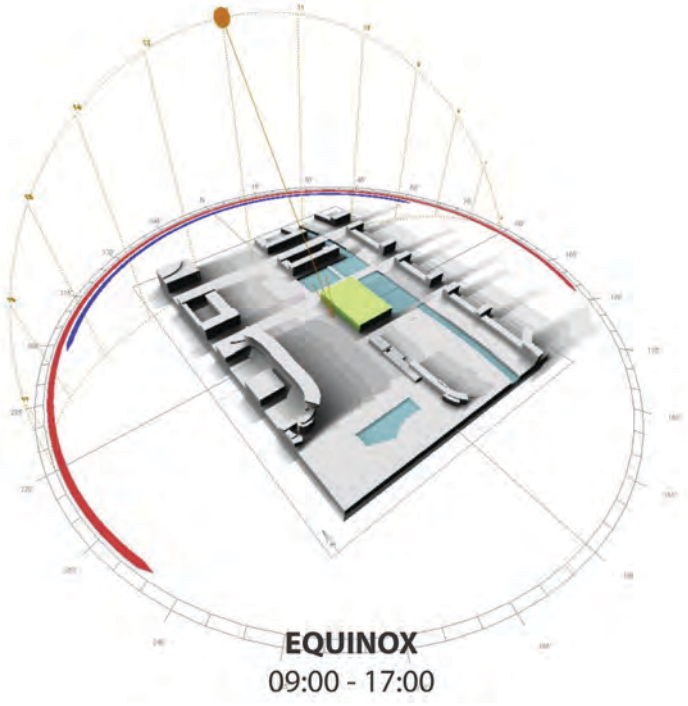
The **solar analysis** reveals how the building effects or is effected by it's surroundings.



WINTER SOLSTICE
09:00 - 17:00



SUMMER SOLSTICE
09:00 - 17:00

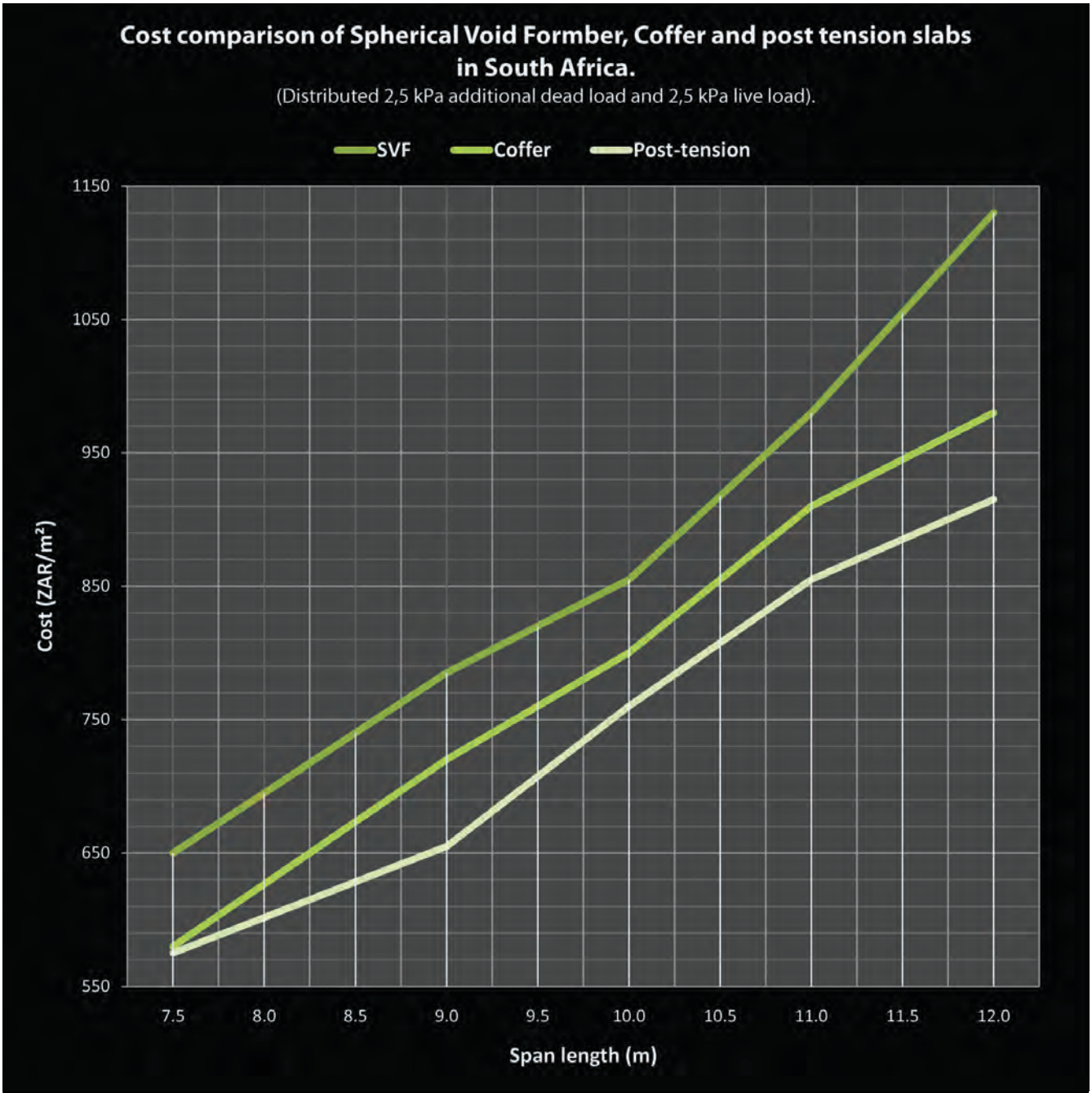


EQUINOX
09:00 - 17:00

9. TECHNICAL RESOLUTION

9.1. Construction System:

In consultation with civil engineer, Rowan Shuttleworth, It was determined that a **250mm post-tension slab** would be most efficient and cost effective (see graph below). The majority of spans within my proposal range between 7m and 10m. **700mm deep beams** where considered best for most spans, with extra steel introduced in the larger spans. The cantilevers needed to be tied back into the building, creating a 'see-saw' effect.



The graph shows that a post tension slab is most cost effective between spans of 7.5m to 12m (Marais, 2010: 10).

- The majority of **columns are 300x550mm** in dimension; in areas of greater loading these were increased to 550x550mm. **The stairs and lifts also act as vertical support shafts. Pile foundations** have been chosen as the soil is composed of sandy clay harbour beds and fill material.

- **The large spans above the pool, sports hall and auditorium were separated from shorter spans in order to create an efficient structural system**. The Large spans will be of a lightweight steel construction. The pool rests on compacted soil due to its massive loading.

- Certain areas within the building would require specialised technical resolution, such as the **piezoelectric sports floor and wave reducing pool edge**.

9.2. Materials:

- In discussions with horticulturist, Brian Tucker, it was determined that the **green exterior skin of my building should be composed off indigenous ground cover or small plants which are low maintenance.** Some indigenous plant species which do well on exterior green roofs and walls include: Zoysia grass, Mondo grass, Coontie palm, Xanadu philodendron, Minima jasmine, Silver sawtooth palmetto, Joseph's CoatMaidenhair vine, Burle Marx philodendron, Zebrina pendula, Dusty Miller and various Sedums. This is just a short list, there hundreds of indigenous plant species which can and are used.

- **Hedera Helix or English ivy would be best for the green filtration lungs of my building as it grows well in partial to full shade. It is an extremely hardy plant which grows to a height of 10m. The primary reason for Hedera Helix was its exceptional ability to remove VOC's from the air.** After 12 hours in a room, it can remove up to 78 percent of airborne mold and 94 percent of airborne faeces. This contributes to a reduction in eye irritation by 52 percent, respiratory problems by 34 percent and headaches by 24 percent. This makes it one of the best know plants to clean the air. All green walls and roof will be installed by a specialised company 'Living Walls'. It is Africa's leading and most experienced living wall design firm in South Africa.

- Glass was used to allow for views in and out of the facility, **increasing transparency and perceived activity,** caution was taken to avoid solar heat gain. The performance glazing from Smartglass -' SolarVue HL'- provides solar control with low reflective appearance. A thin deposit

of nickel and chromium eliminates more than 50% of solar heat, while transmitting more than 50% of visible light. SolarVue also eliminates more than 99% of damaging UV radiation.

- **Recycled aluminium Cladding** will express the high tech nature of the facility. Aluminium will be a **durable, low maintenance** solution. Its high **corrosion resistance** is important as the Kings Park Precinct will be exposed to ocean air. It offers thermal protection and insulation, reduced sound transmission, and is recyclable. Aluminium can be recycled indefinitely with no loss of properties. **Recycled aluminium requires less than 5% of the energy need to create a new product. This reduces the embodies energy dramatically.** The product is 'Hula-Bond' supplied by Hulamin (Van Wyk, 2009: 209).

- The primary flooring used is **polished concrete**; similar to that of the adjacent **Moses Mabhida Stadium.** It eliminates the need for a topical coating and reduces maintenance costs significantly. To ensure the is no moisture penetration a 'Radcon' cristiline admixture is added to the concrete. The minimum fall of the concrete surface is 1:100. The company which was contracted for the Moses Mabhida Stadium, 'Concrete Lazer Flooring', will be used for the concrete polishing.

- The white vertical louvers on the west close at night to **form a media screen which responds to the adjacent fan park. This also creates valuable advertising real-estate to generate income.**

- All materials will be **sourced locally** to stimulate local economic growth.

10. CONCLUSION

In conclusion, the design proposal set out **to create an appropriate architectural/urban design intervention for Durban, in order to harness South Africa's sporting talent and uplift an area of 'lost space' through the creation of a meaningful architectural response.**

The urban design used the opportunity of the **2020 Olympics** as a means of generating an urban framework for the Kings Park Precinct, which would **uplift this area of 'lost space'** . The primary goal of this urban design was to **highlight the uniqueness of the region whilst benefiting the users of the city well beyond the requirements of the Olympic bid.**

The architectural design of the HPC focused on identifying an **appropriate and meaningful architecture which expresses the DNA of the building while relating to the users and surrounding environment.** For this reason the design strove to create **a healthy / environmentally sustainable environment which would allow the users to maximise their sporting potential.** Another important aim was to **maintain and preserve the natural ecological balance in the Kings Park precinct,** as it is one of Durban's few remaining green open spaces near the heart of the city.

The successful design of this urban framework and High Performance Centre for the Kings Park Precinct would ultimately harness South Africa's sporting talent whilst revitalizing an area of 'lost space' , further establishing Durban as 'the sporting capital of Africa'.

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