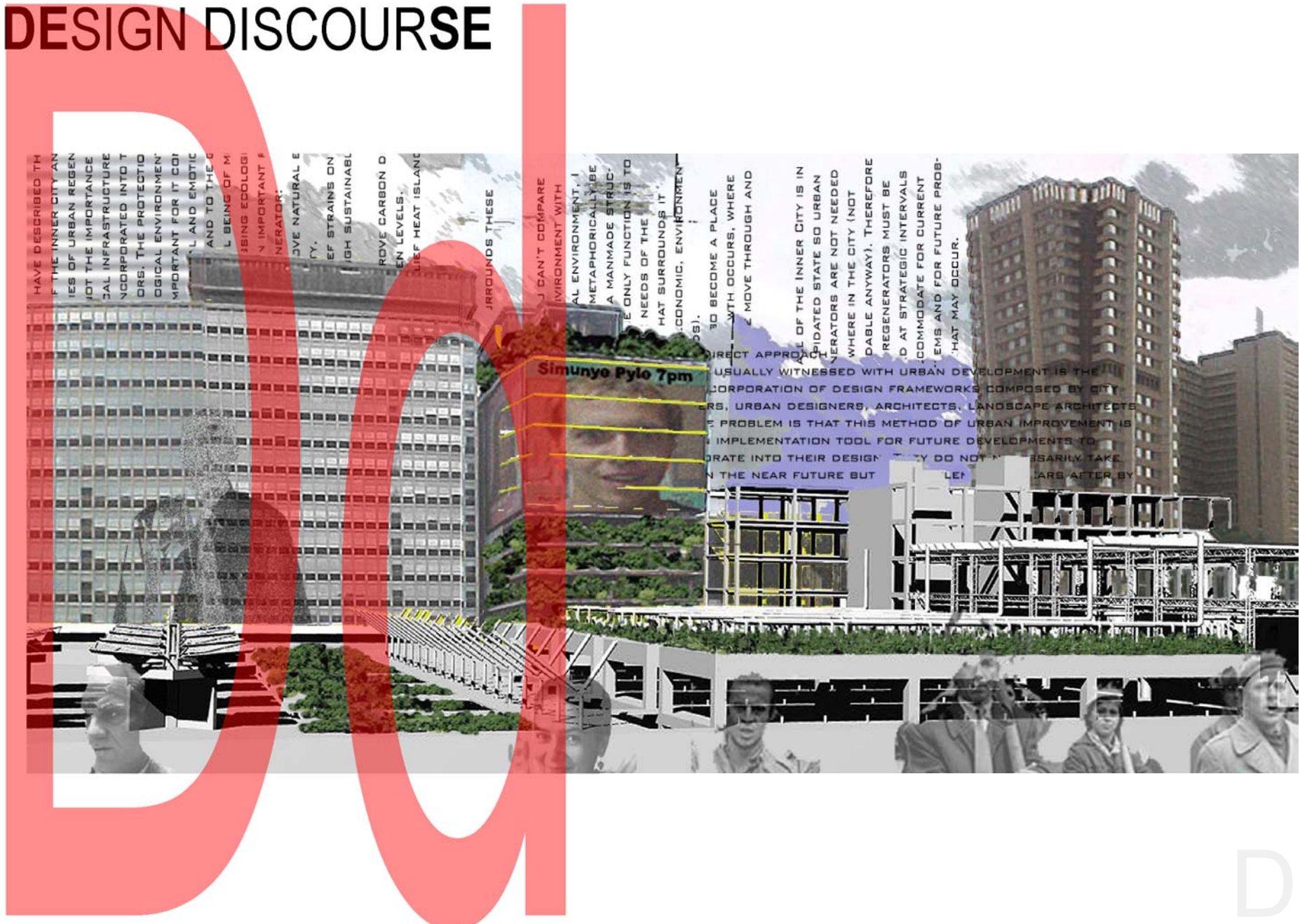


# INNER CITY REGENERATION

# DESIGN DISCOURSE



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Fig 1 -25: Author

# CHAPTER 1

## URBAN DESIGN



## 1 URBAN DESIGN DEVELOPMENT

### 1.1 INTRODUCTION

As we have entered the *eco-systemic paradigm* (even in Pretoria), it is quite a sigh of relief for me, knowing that soon super fast eclectic/copied developments (sometimes even the architect is cut out to “save money and time”) will have to be a thing of the past. Architects have a responsibility and are now forced to deal with our environmental issues at hand. Another point that I am looking forward to is the new wave of architecture that will originate from it. The development of a new harmless, honest, interesting and far more challenging design era, which fits its time of need. It also forms part of a larger system, which is preparing ourselves to live on earth with less energy requirements per day than the earth recharges per day; and helping along the process by filtering the earth's fabric. This is a natural process handled by earth for some pollutants, unless the wastage per day exceeds the earth's ability and capacity of filtering per day.

### 1.2 PRETORIA/TSHWANE INNER CITY

Many cities in South Africa are in a state of decay. Fortunately the problems are being addressed by some organisation or group.

Pretoria/Tshwane's inner city is not in total decay, on the contrary there are extremely attractive areas in the Jacaranda city, but some areas are still a cause of concern.

Part of this discourse will briefly explain from different aspects (urban design, building design) what my intentions were to try and regenerate these pieces of urban fabric and the environment in which it finds itself.

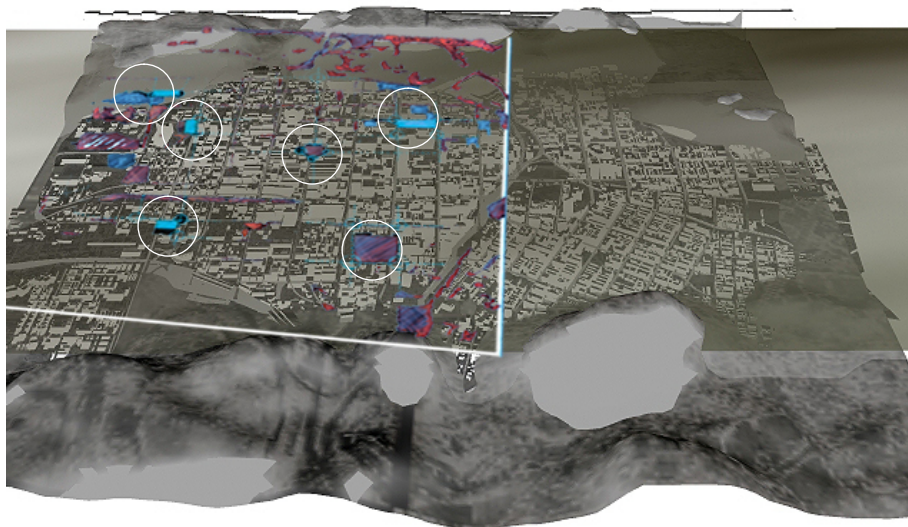


Fig 1: Urban Regenerators in the Inner City

### 1.2.1 Client

#### The Pretoria Inner City Partnership

The Pretoria Inner City Partnership was formed to consist of business people, stakeholders and representatives of various interest groups who are concerned about the well-being of the inner city. This was after The Pretoria City Council realized that a new approach to the planning, development and environmental management of Pretoria was necessary. This was not the first time something of this nature was attempted to ensure environmental quality and quality of life for the city of Pretoria. The reason for this was the neglect to involve all role players and stakeholders in the process of planning and implementation. This realization led to the development of an Environmental Management Programme for Pretoria (EMPRET). This programme was intended to be a participatory, integrated and holistic approach to planning, developing and implementing environmental management for Pretoria. The aim of this programme was to involve a wide variety of stakeholders to participate in planning and implementing development strategy to achieve *economic, environmental and social sustainability*. The focus of the programme was the total environment that included the natural, built, social, and external aspects of the environment as well as the interaction between these different aspects.

The client and I therefore have a common goal by wanting to restore the areas of concern in the inner city to healthy urban fabric.

### 1.3 URBAN DESIGN

#### 1.3.1 Urban regenerator

Inner City Regenerators refer to an urban structural entity that represents an immediate response to a problematic area in the inner city by creating a space that addresses the problems that surround it through environmental, economic and social assessment. The building is designed to regenerate a healthy urban space and to sustain it. The success of a regenerator lies in the possibility that it would cause the area to become a self-sustainable urban space. It becomes a manmade structure whose only function is to fulfil the needs of the context that surrounds it (social, economic, environmental). It can also become a place where growth occurs, where life moves through and stays.

An important aspect of this regenerator is that it must be able to change over time as the specific economical environmental and social needs of its context change throughout time.

There are two different positions where a generator might be placed.

1. First a generator can be placed inside dilapidated fabric. This position entails that the regenerator has to be the source of healthy economical, social and environmental resources. The generator cannot feed off neighbouring urban fabric to help regenerate the area it was created for.
2. The second position can be between a healthy piece of urban fabric and a dilapidated piece. This position entails that the generator can feed off a good piece and, in a way, pass it on to the bad sector. The generator will, in itself, still be an economical, social and environmental resource.

Erf 3200 is a site that is in between a vibrant busy section of the inner city and a dilapidating unsafe part of it. The second position described above.

### 1.3.2 Social environmental and economical assessment

Different societies call for different social, environmental and economical help because the needs of different societies fluctuate. Therefore you first need to define these needs to be able to support such a society.

#### 1.3.2.1 Social assessment

*A healthy life can be defined as a place where the earth's surface and atmosphere is clean rendering an environment that is free of diseases. A secure place that enables you to feel freer and in turn promotes participation in outdoor recreational activities in your time of rest, instead of hiding in a safe apartment or house. A place where the economical infrastructure allows everyone to have a job that is fulfilling, adding confidence to their self esteem and hope for the future.*

There is a very strong institutional presence around the site except towards the west. To the east and south a large number of medical and cultural institutions are spread throughout quite a number of city blocks.

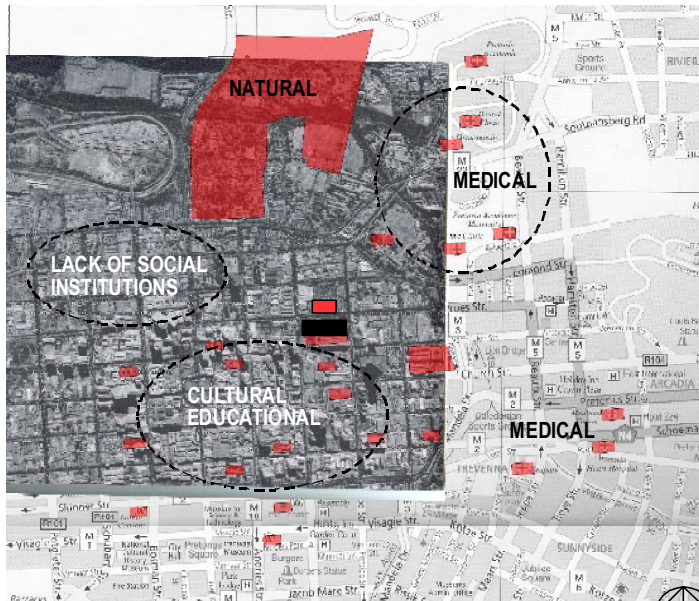


Fig 2: Social character of context



The number of health institutions does indicate that there is not a need for healthcare in this sector of the inner city, but a possibility to promote health awareness. The location of the site next to Van Der Walt Street becomes an important aspect as this route is used by thousands and thousands of commuters/public per day. This was seen as an opportunity to bring about an element of health awareness to the people and the surrounding community. A facility that is based on informing the public about health situations and able to assess certain health problems that may occur.

To become a place that houses a healthy environment, the facility itself should be able to render an environment that has clean air, clean water and adequate waste disposal. This was incorporated into the design of the building. Another requirement is that it should be located near public transport.



Fig 3: Corner of Van Der Walt and Proes Streets

Another social aspect that needs to be addressed is the lack of accessible green social spaces. For various reasons this is an important aspect of urban design. People need a common space where they can meet, relax and come into contact with the biophysical environment. This, for me, is a very important and essential element of urban life.

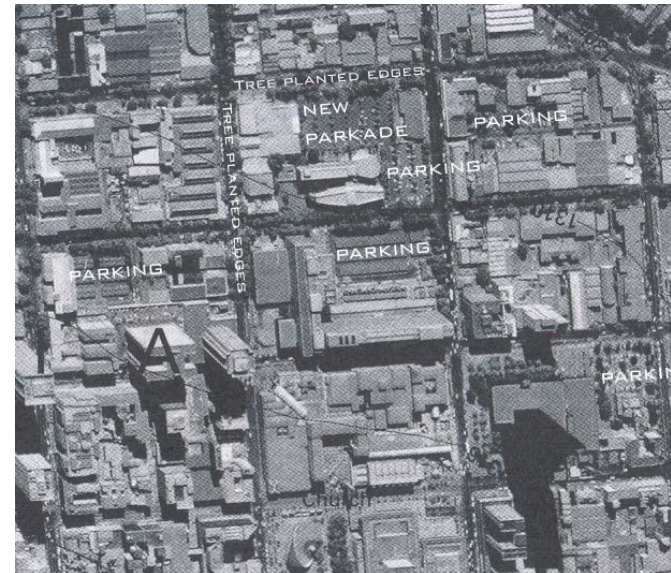


Fig 4: Excessive amount of parking to be replaced by green space

new parkade replaces most surrounding parking facilities creating opportunities for urban green pockets

The area which is currently the parking area for the Munitoria complex will be transformed into an urban green park. New parking will be relocated to a parcade located at the existing parking space on the corner of Proes and Struben Streets. This multi-level parking space will accommodate and replace most of the surrounding parking areas. These spaces can then be transformed into green urban pockets that can become small usable interesting urban spaces rather than an empty hot surface of tar.

An additional factor that contributes to the current urban problem, not only in the area around the site but throughout the inner city, is homelessness and unemployment. People living off the street have their ambitions restricted and are exposed to the harsh conditions of the inner city not to mention the lifestyle and accompanying habits that a person has to adapt/acquire. They need to be informed and given the chance of acquiring skills that would help them to create a career which they will find fulfilling and worthwhile. This is most certainly easier said than done. None-the-less a centre is needed where any person can be trained informed and armed with information and skills that will help them make use of the opportunities which they will be faced with in time to come. This centre will house various programmes that include helping to train the people that live on street to acquire skills or help them look for work opportunities. The environment that it is placed in should promote learning and be in a protected urban position. Informal learning should relate to places of high activity, like Van Der Walt Street, which hosts the business that they are learning about. It will be a facility that serves its pupils and the broader community. The broader community will mostly be accommodated at night and the pupils throughout the day. The facility must also be seen as part of the city wide system of education, like the surrounding educational institutions, and be placed near public transport. This will help the centre to become available to a broader community.

1.3.2.2 Economical assessment

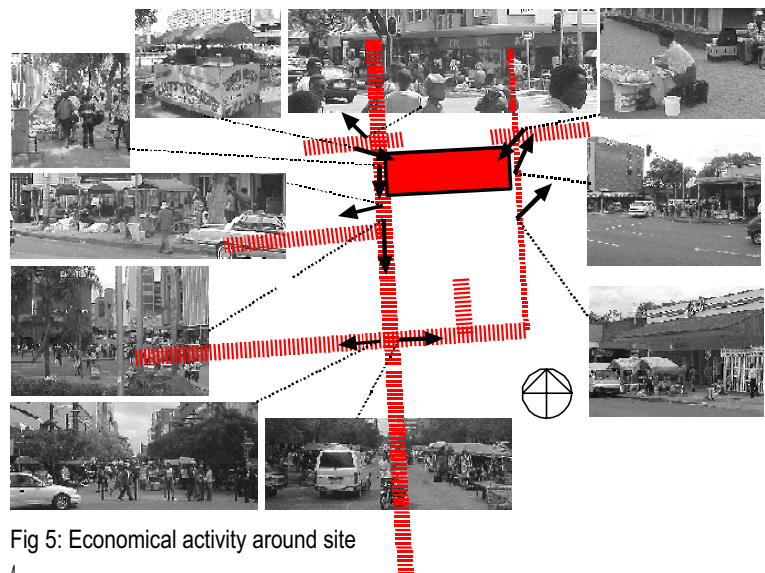


Fig 5: Economical activity around site

There are two different economical phenomena in the area that has influenced the design. The first is the strong economical belt that stretches along Van Der Walt Street. This belt has been established because of the vast numbers of pedestrians/commuters that use this route over the years since the development of the taxi rank Van Der Walt Street terminates. This belt has potential for development, if will, not only attract users to the generator but also to create opportunity for contact with a large number of city dwellers. This will help the centre to achieve some of its goals. Structured market stalls have been placed along the western and part northern edge of the building. They will be used for pedestrians to sit and rest, and for vendors to sell their products.



taxi rank

site  
(cnr. of Van Der Walt  
and Proes)

Fig 6: Economical belt terminating in taxi rank

Second is the slow process of skills development and economical growth of active retail vendors. Therefore the generator will host a training centre that is focused on teaching learners most basic skills from handcrafting and art to computer literacy. An important part of this facility is the training of the surrounding market vendors. The aim of the centre is to help them develop their economical capabilities to allow them to grow. They will also be given the chance to test and develop their new skills in the urban market which is situated in the urban park. They will be able to manufacture their own products in the workshop to sell at these markets.



different stages of market and economic development



Fig 7-9: Different types and stages of economical growth

The markets in the in the park and along the edges of the building will provide access for small operators. The large number of operators in and around the site will increase the drawing capacity of the facility. Their proximity to other traders will have an advantageous co-operating effect. The markets will provide a service of most products found in supermarkets to cater for the commuters and building users, so that they don't to travel as much. The trading market space inside the park will be permanent and created as an environmental asset by incorporating planting with the structure of the market stalls. This will help the stalls become part of the green open space system. The market structures along the street edges will be semi-permanent. It will serve as shelter for pedestrians as well.



Fig 10: Urban park market

### 1.3.2.3 Environmental assessment

Urban green areas, both public open spaces such as parks and private planted areas around buildings can have a marked effect on many aspects of the quality of the urban environment and richness of life in a city. The environmental conditions within a public urban open space may have significant effect on the comfort conditions experienced by the persons using them, and consequently on their utilization by the public, especially in places or seasons of stressful climate. In addition to its effect on the overall urban climate and microclimate around buildings, urban vegetation affects air pollution, levels of nuisance from noise sources, social activities, aesthetic appearance and so forth. [Givoni. 1998: p303]

The most important environmental features of the site were the aquifer beneath the site and the sun. The aquifer was used for its source of clean and cold water as well as its filtering process. The sun was used as a source of free energy.

### Urban heat island

Within the fossil fuel consumption, and the resulting air pollution, noise, and heat island effect, our daily urban activities have caused change in climate and air quality which threaten the environmental sustainability of cities. [Yannas, 2001: p281]

### The main factors that differentiate the urban climate from the suburban climate:

Anthropogenic heat production:

Anthropogenic heat production arises from a large variety of human activities inside and outside buildings. [Yannas, S. 2001.p282]

Airflow patterns and humidity:

Owing to the sheltering effect of buildings, wind velocities are generally lower than in the open country. The result is a reduced rate of heat dissipation by convective cooling.

The *cooling effect of vegetation* has been reported by many researchers comparing the temperatures in parks with those in street canyons. The advantageous effect of *evaporative cooling* and the shading and cooling effect of vegetation have been proven over and over and yet *most cities lack substantial green areas and bodies of water and thus obtain little benefit from evapotranspiration and evaporative cooling*. Consequently, humidity tends to be lower in the city than in rural areas. [Yannas, 2001:p282]

Effect of air pollution:

The two main families of pollutants have opposite effects on the urban climate. *Greenhouse gases* such as CO<sub>2</sub> and CH<sub>4</sub> absorb long-wave radiation emitted by terrestrial surfaces. This reduces the rate of cooling of these surfaces, resulting in a warming effect at ground level, thus contributing to the urban heat island.

*Aerosols* on the other hand, obstruct solar radiation reducing the amount transmitted through the urban atmosphere and reaching the ground. One effect of such reduction is in the form of lower temperatures at ground level. [Yannas, S. 2001.p282]



Fig 11: Panorama of showing the polluted urban canopy of Pretoria/Tshwane inner city.

Built form:

Built density and built form are composite variables combining parameters such as the area of exposed surfaces, the thermal capacities and surface reflectances of built elements, and the view of the sun and sky by surfaces.

### Environmental threats in Pretoria/Tshwane:

The volume of air that is affected by the city is called the urban boundary layer or urban canopy. In Pretoria/Tshwane this air dome is blocked off by the two ridges in between which the CBD lies. This causes the turbid polluted air to stay hovering above the urban field and not disperse past the ridges. This has a complicated effect where, as described in the effects that air pollution can have, the heat island effect is aggravated by the hovering polluted air. This causes unhealthy conditions for city dwellers not to mention global environmental implications.



Fig 12: Urban canopy

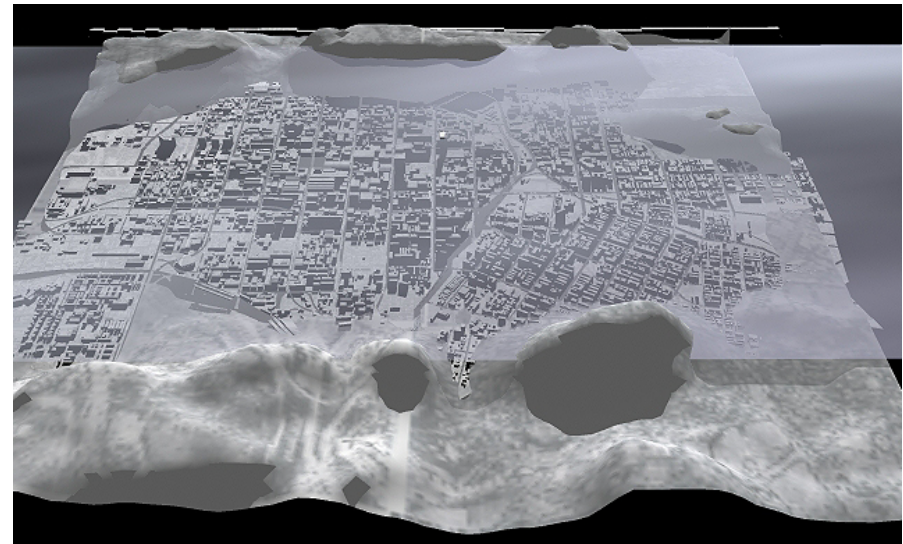


Fig 13 Model of inner city illustrating the entrapment process

Environmental Problems in Pretoria/Tshwane CBD:

- Trapped turbid and polluted air conditions in the CBD
- Urban heat island effect that add to the global warming effect.

Urban Heat Island Effect [Givoni, B. 1998.p244]

Factors influencing the urban heat island effect:

- Net radiance between urban and rural space. The daytime net radiance at ground level may be smaller than rural but it has a lower rate of cooling during the night which causes urban settlement to have a higher temperature.
- Storage in mass



Concentrated heat generation by activities/anthropogenic heat release.  
 Lower evaporation by soil and vegetation. Therefore using vegetation throughout the site even on rooftops increases the evaporation caused by the sunlight which otherwise would have been stored by normal building mass. Storing heat in mass of buildings is good passive design tool. In the design of my building other means of passive design and sunlight manipulation have been applied to create the wanted heating and cooling effect.  
 Seasonal heat sources. Heating in winter and air conditioning in summer have been replaced by systems that use the resources around the site like the aquifer found beneath the site and the sun, which is the best source of free energy you can find. By using these resources it contributes to sustainable development by not depleting the earth's resources.

Factors that can be modified [Givoni, B. 1998.p244]

- Colours of buildings.
- Distribution of urban vegetation.
- Energy use for heating and cooling.
- Density of built-up areas and types of buildings.
- Orientation in terms of wind direction.

### Vegetation

The absorption coefficient of a leaf = + 0,8. This energy is spent on evapotranspiration of the water from the leaves. This increases the humidity of the urban microclimate rather than having a temperature increase. This is a positive aspect as the humidity of the urban environment is lower than the suburbs.

The absorption coefficient for soil = 0,4 for sand and 0,8 for dark loam soil. A lot of the energy is spent on the evaporation of the soil's moisture reducing the temperature elevation of the surface. The rest of the energy goes down deeper and comes out at night, reducing the rate of cooling caused by long wave radiant heat loss. This character can be useful as the green roof can be used to absorb heat energy during winters if the vegetation is deciduous. During the summer the vegetation would then absorb most of the heat energy for evapotranspiration keeping the surface of the roof in a cool condition. Another positive aspect of the roof structure is the enlarged surface of the roof. This increases the absorption rate of heat energy from the interior spaces.

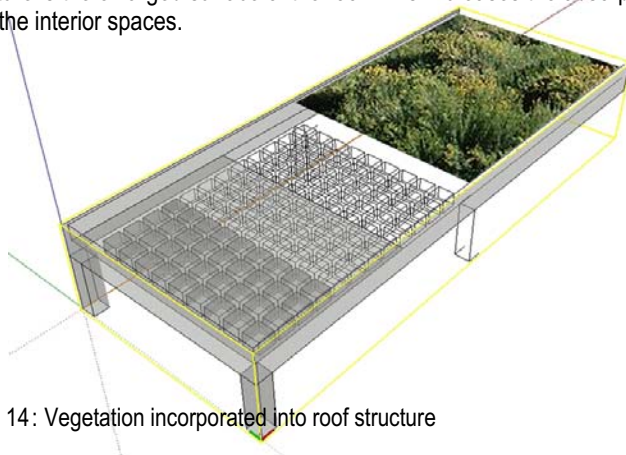


Fig 14: Vegetation incorporated into roof structure

Vegetation can reduce wind velocities to create favourable conditions for pedestrians. Pretoria/Tshwane on the other hand is not afflicted by ravaging winds like Port Elisabeth.

Vegetation absorbs Carbon Dioxide. It captures the larger dust particles depending on the amount of foliage. This can be an important factor for a place like Pretoria/Tshwane that has hot summers (sometimes dry periods) and dry winters where a lot of dust can be produced.

The advantageous effect of using vegetation in an urban context should be apparent in all cases of urban environmental problems. The filtering of particles in turbid air (by absorbing larger dust particles); cooling effect it has on the urban micro climate and the improvement of air quality. Using green roofs has an insulating effect as well. It is for these reasons that vegetation was used so extensively throughout the design. The many facets of its application were explored to create an environment that is healthy for city dwellers and the ecological environment, and to explore the pleasing aesthetic effect of vegetation if it is incorporated into the design of the building.

Objectives:

- Improve natural eco-systems in the city.
- Relieve strain on resources through sustainable development. This includes designing air conditioning systems that cool and heats by the use of the available free energy around the site.
- Improve carbon dioxide and oxygen levels in a vehicular orientated infrastructure by incorporating vegetation
- Relief heat island effect.
- Filter turbid air by incorporating vegetation into vertical and horizontal landscaping

### 1.3.3 Urban Design Influences

#### Creating a Responsive Environments

To make the place responsive Bentley's *Responsive Environments* was used in the urban design:

Permeability;

Only places which are accessible to people can offer them choices. The number of alternative routes through an environment is therefore central to making responsive environments. A series of alternative routes through the site were created to ensure permeability- a walkway from the west that cuts through the middle of the site; a walkway from the south that runs beneath the existing munitoria site. This passage connects with the Sammy Marks Plaza and therefore becomes quite an interesting and important connecting path. Various ways to enter the site are located on the north and east side. There is also a route that runs from the middle of the site through the neighbouring block on the north side. This leads to the parkade and Struben Street. These two last mentioned passages are prescribed by the framework (include in Brief) and forms part of the larger urban design proposal. Entrances for the building are located on the north and south side.

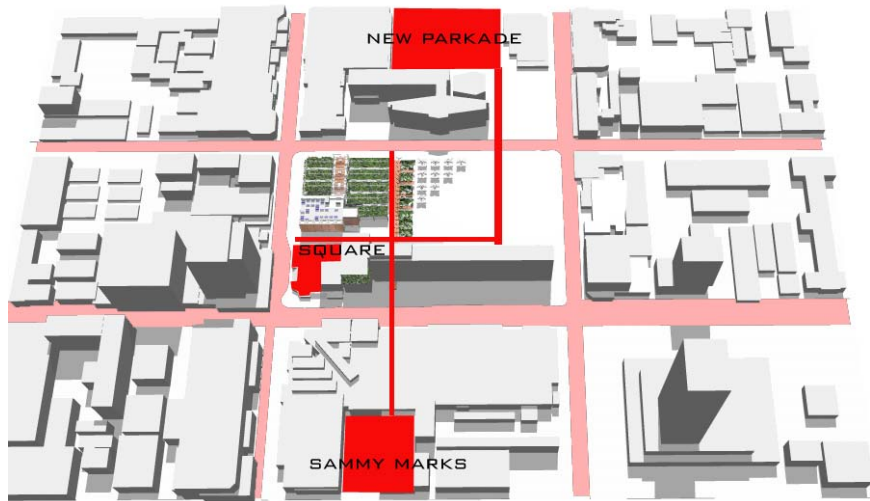


Fig 15: Permeability

**Variety:**

The project offers a choice of experience through variety of uses which derive from the site assessment as described.

**Legibility:**

The legibility of the site layout was achieved through visual connection and the building's geometric relationship, in terms of height and shape, with the neighbouring Munitoria building. Routes are straight and differ from each other making it easier to differentiate between them. Some hover above water, some are placed on the ground and others are suspended in space.

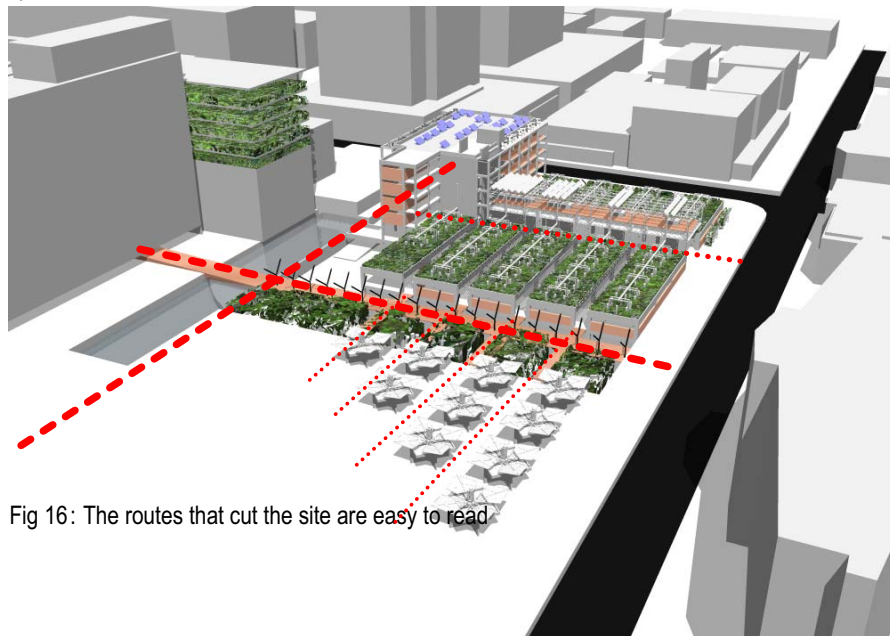


Fig 16: The routes that cut the site are easy to read

**Robustness:**

Places that can be used for different purposes offer their users more choice. The structure (including the floor) of the office and lower complex is designed to allow for a variety of activities. The urban park and market spaces on the site add to a robust outside space.

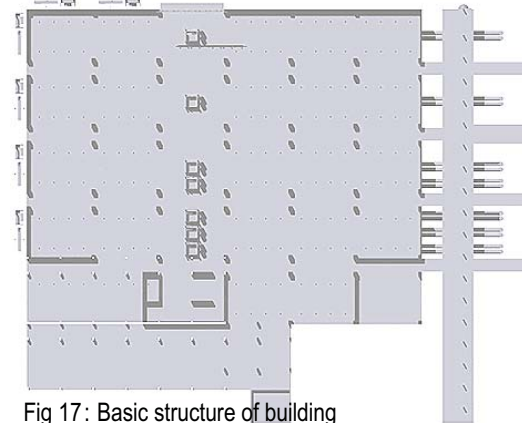


Fig 17: Basic structure of building

**Visual appropriateness:**

People interpret places as having meaning. The external look of the building should make the people aware of what is offered to them. The office facility's transparency will help people to be able to see what the complex has to offer. The lower complex's atrium tells the user of a large walkway expressing its public character.

**Richness:**

To increase the sense experience of the user a variety of spaces are created to ensure the richness of the space. First you have the urban park which brings the user into contact with the ecological environment. The bridge that connects Munitoria with Proes Street (north of site) first runs over a water feature and then hover one floor above ground until you reach Proes Street. This can have various sensory effects on a person. The play between steel wood course brick and rock finishes further enriches the project by combining technology with the biophysical environment.

**Personalisation:**

Personalisation is encouraged especially in the markets inside the park and along the street edges. This aesthetic effect will add to the uniqueness of the spaces that surround the building. It causes a humble and welcoming effect.

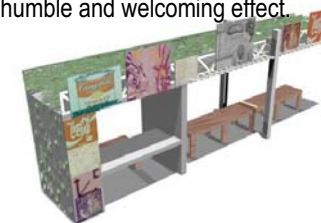


Fig 18: Personalisation of market stalls

### The Elements of Structure

The elements of non-programmatic structural environments are more generic and consist of four closely-interrelated concepts that are applied to the urban design of the project. [Dewar, D. Uytenbogaardt, RS. p18]. Only three are discussed

#### Space:

All the public spaces around the building were seen as social spaces. The main reason for creating the urban park was for social purposes. The public square, which is partly closed off, will be reopened to become a public square and social space that is connected to the urban park. This becomes an important connection that creates a whole between the park and the corner of Van Der Walt - and Vermeulen Street. This is one of the corners of an extremely vibrant urban space which again connects with Sammy Marks Square. This is the second connection with Sammy Marks Square. Sammy Marks Square forms part of a larger and very successful economic system that stretches as far as Church Plain in the centre of the Inner City. This not only adds to the connectivity of these spaces, but brings forth a type of wholeness to all of these spaces and will be referred to as one large social structure.

#### Place:

The concept of place implies embracing, and consciously seeking to promote, uniqueness as opposed to standardisation. [Dewar, D. Uytenbogaardt, RS. p19]

The importance and extensive use of vegetation in the project created the opportunity to design a unique place. The lack of vegetation in the inner city's urban fabric (street edges not included) will further strengthen this character which the project will have. This concluded the decision to use vegetation at horizontal and vertical level.

Another factor that will help to create a place is the way in which the user/pedestrian will come in contact with the many distinguished ecological features found on site.

The project will also become a place that is recognised for repetitive use by the community. It becomes a place of gathering of urban life: commercial, educational, health care and outdoor activities will always be celebrated here.

#### Connection:

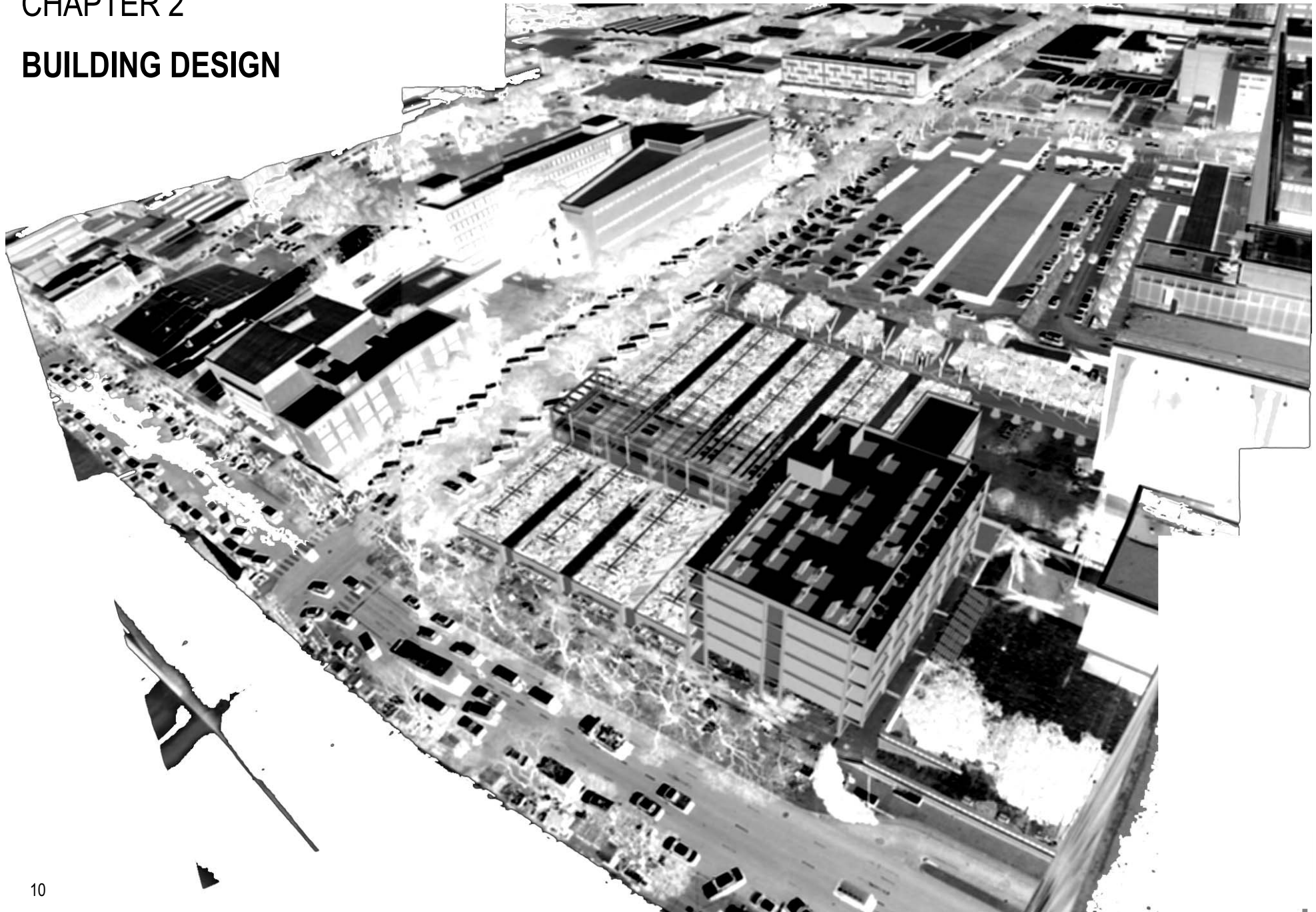
Creating a movement web along and through the site allow for public life to take place in it. The placements of these routes were not created purely by technocratic issues but by issues that concern the public and the user like social humanist and environmental issues. It has a structural significance that defies the strong definition of the city block, which is hard to do as this is a strong element of definition especially combined with a vehicular orientated infrastructure. The complexity and detail of these webs send structural signals to individuals, groups and entrepreneurs that will use these spaces and is offered its range of choices and opportunities.



Fig 19: Aerial view of project

# CHAPTER 2

## BUILDING DESIGN



## 2.2 BUILDING DESIGN

At the start of the project the thought behind an Urban Regenerator created an image in my mind of large and fat towering building placed somewhere near the middle of the inner city that looked like the gigantic interior of a computer box that is infested with vegetation. I liked it, but after urban, site, economic, social and environmental analysis the image downsized to a humble building on the corner of Proes - and Van Der Walt Street on top of a large hole. I couldn't help but to like it more.

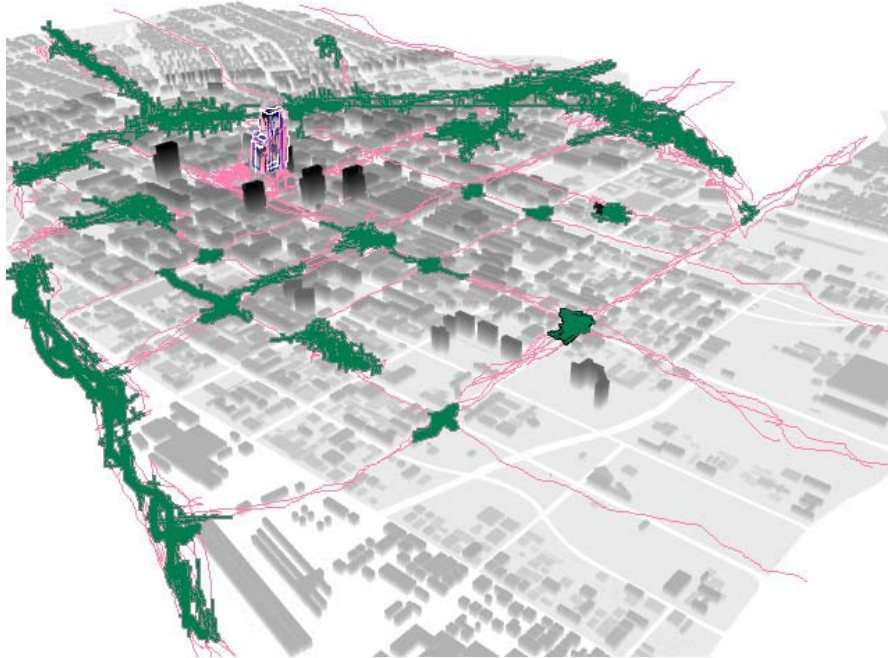


Fig 20: Image of an Urban Regenerator

The most basic form of the generator, which is the structure, systems and spaces formed by it, would become the essence of the concept of an urban regenerator. Functions will change over time but the basic form is what will sustain urban regeneration.

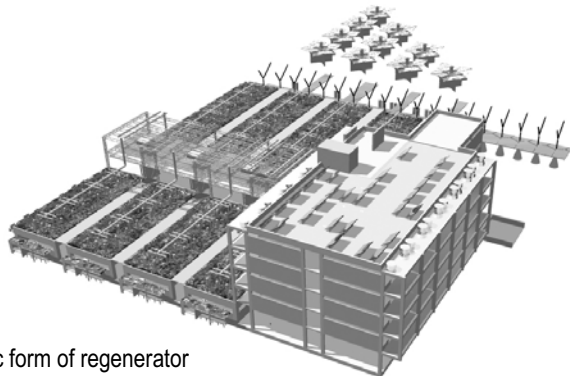


Fig 21: Basic form of regenerator

I read an interesting article by Gert Swart in the *Leading Architecture* of 2003 Sept/Oct. The article concerns Peter Buchanan's work, ideas and some of the principles and characteristics that contemporary architecture should abide by. The reason for adding it to the document is that I feel most of the points Peter is trying to make resemble my premature design beliefs which I have tried to explain in my thesis and design theories. Only the parts I relate to are added.

Buchanan draws attention to two very important and related current (topical) issues: Architecture as the creation of events and therefore emulating (not imitating) the evolving nature and dynamic quality of experience; existence and life as 'becoming' rather than static 'being'; and *architecture as emulating nature and its continually evolving process to create organic wholes that is consistent yet changing, finite yet open.*

He criticises today's architectural and urban banalities creating a fragmented wasteland, where each object is separate and neither relates to, nor enters into dialogue with anything else; creating a world that is falling apart because each object looks only to itself, and is standardised *so as to be placed anywhere.*

Buchanan refers to the cultural critic Charlene Spretnak's term 'Ecological Postmodernism' as the emergent paradigm characterising the transitional period we now live in. (I am not familiar with her so I'll refer to Roger Fisher's 'Eco-systemic Paradigm').

Peter Buchanan derived some very important principles and characteristics that contemporary architecture should abide by:

Design should involve more than serving function, organising and expressing construction and services, and responding to context. Instead it should involve analysing and intuiting forces that might impact, in any way, on the time, place and programme, *and then guiding these forces to ends best suited to not just the client and user, but also the larger world around: the city its citizens and nature with all its ambient forces and creatures.*

Design therefore is an art not of imposition but of detecting and bringing into play latent potentials, of helping these all to flower into form. Rather than being a constraint, it involves a vastly expanded kind of creativity, one less egotistical than in the former paradigms.

*The result would be regenerative and reconciliatory, not just helping the new to be born, but also to heal the modern era's assaults on the city and the psyche, on community, nature, and the particulars of place.*

Design should not be burdened by any dogmatically narrow, theoretical approach or design idiom. Instead it should be shaped to an exceptional degree by programme (including function and technology), the place and its traditions, as well as an urge to settle into and integrate with the surroundings and the times.

Guided by instinct and intuition rather than intellect alone, design requires a balance between science and craft, head and hand, experiment and memory. *It is therefore not necessary for technology to be incompatible with nature or history, and is particularly exemplified in the use of mix technologies, that is traditional crafts and its adaptation where applicable, together with the newest and most sophisticated available. Yet also adapted to the particular problem at hand.*

Rather than applying standardised parts, the smaller structural and functional units should grow 'naturally' from the particular design problem as a whole, emulating the forms and the close fit of form to function as found in nature.

[Swart, G.2003. p16]

### 2.3 Lower Complex

The project consist of an urban - park and market, street market and a building complex that consist of a lower complex and an office complex.

The lower complex and office complex were placed on top of the old basement. It was used as a space to house the systems of the building and offered extra parking. It had to be the corner of Proes and Van Der Walt being the most used. It also added to a certain degree to the continuity of the urban fabric. The scale of the complex would fit better in this position as in any other position, it would clash with the scale of the munitoria building. Besides, the current parking space for Munitoria was reserved for the urban park which could not have been placed on top of the basement, as it would amount to a large degree of excavation and fill of usable soil.

The structure of the lower complex was designed to accommodate as many different functions as possible. The distances between columns were derived from the accommodation schedule, where each function was given an area. These areas were used to calculate an average usable space for the different functions the schedule prescribes. This helps ensure the robust character of the lower complex, which is, to be able to adjust as the social and economical needs of its context change.

The atrium was designed to contain the heat exchangers and include the main space for movement inside the building. A deck was placed on top and is accessible to all building users.

A grid of walkways/passages was superimposed on the layout of the lower complex. These passages would serve as a source of natural light to the cells that they cause to form. They also structure potential entrances from the west - and eastern side of the building for when it changes. In addition, they serve as fire-escapes from various areas inside the complex.



Fig 22: Lower complex

### 2.4 Office Complex

The office complex was created as space for the client at first, but was transformed to serve as a financial incubator for the lower complex and the urban park (as addition to the financial support it has from its stakeholders). Therefore it serves as office space for the client, and to other corporations.

The complex was connected to the lower complex to enable a support system between the facilities.

Another factor adding to its placement (and for its lucidity) is the views of street life you are able to witness from this position.

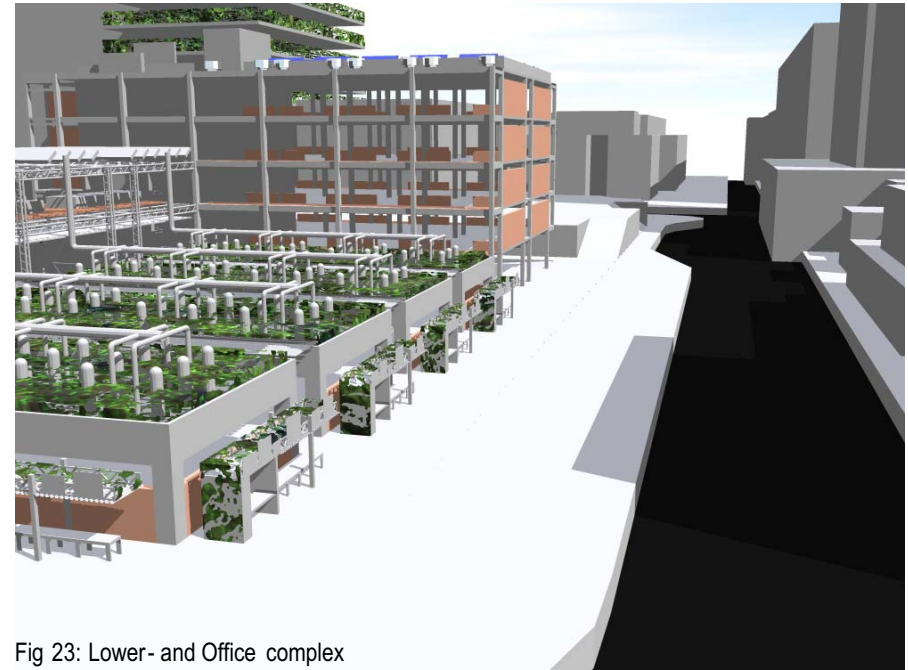


Fig 23: Lower- and Office complex

### 2.5 Architecture

It was imperative that in designing the building, its function would be kept in mind while the forces that surround the site would mould the building form. This enables the building to not look onto itself but rather to its context and the state that it is in. This would make the design unique in the sense that the building could be placed nowhere else.

Another prerequisite I wanted from the aesthetic was the building to look humble and inviting to the public. I tried to let the context, place and its demands determine the aesthetic of the building with a personal touch, rather than have a personal style that would dominate the aesthetic while its function is cramped into a design that doesn't fit the context or the building itself.

After deciding the requirements for the lower complex other functions of the whole building had to be realised. The incubator, which has already been discussed, and the underlying systems that supports these functions. Systems that would sustain human comfort inside the facility

## 2.6 Systems

It is imperative that these systems were not added on as normal mechanical systems, which is placed in the small hidden spaces the designer left open for post application. They should not be dependent on resources that cause unsustainable environmental conditions. They should be derived from what free energy/resources the site has to offer. They will be the arteries of the building that digs in the ground or grasp at the light to attain the resource they need from the context to sustain human comfort. The systems are not hidden but exposed to the user and public for awareness purposes and for the interesting aesthetic that it generates.

Comfort is a subjective matter and will vary with individuals. It involves large number of variables, some which are physical and physiological based for understanding. Classically for thermal comfort they include

Air temperature and temperature gradients.

Radiant temperature.

Air movement.

Ambient water vapour pressure.

Amount of clothing worn by occupants.

Occupants level of activity.

Other factors include general comfort and light levels, the amount of noise and the presence of odours. Individuals are also affected by such psychological factors as having a pleasant view, control of their environment and having interesting work.

To be thermally comfortable one must not feel too hot or too cold, or have any part of the body too hot or cold. The naked body if shaded from the sun can be quite comfortable around 28° - 30°C and at moderate humidity.

[Givoni, B. 1998.p7, 8, 9]

Pretoria's/Tshwane's average maximum temperature during summer/rainfall season average about 28°C. Much higher diurnal temperatures are recorded during the summer that reaches above 33°C. Urban micro climate conditions add to these because of the urban heat island effect. These temperatures become even more extreme for the body in a dry climate like Pretoria/Tshwane. Minimum temperatures can reach 4, 5°C during June/July. Although these temperatures are bearable, having to cope with it in a working/ learning environment is unfavourable and cause discomfort to the user.

### CONTEXT

Finding the resources on site was quite an interesting and exciting task. The sun is the perfect resource for heat energy. The problem was finding a cooling source. This would make the system very unique as an aquifer is found beneath the site. If the building were placed a block further on either side of the site it would not have been able to use this aquifer.

The sun's energy can be used for photovoltaic application and to use in passive and active systems to create energy and heat.

The aquifer is a source of clean fresh cool water and can be used for filtering purposes.

Another asset of the site that would help for cooling purposes is the soil beneath the site.

Vegetation will be applied in all the systems and becomes an important tool to create healthy comfortable conditions.

### LOWER COMPLEX

The system designed for the lower complex is an active system that uses the cooling effect of water and soil, and the heating effect of the sun. The main tools that are involved are solar flat plate collectors for heating and pumps for movement. The system is based on water movement and heat transfer.

The heat exchanger specifically designed for the lower complex has quite a development history, which I quickly want to share with you.

Baruch Givoni originally developed a cooling tower for the 1992 EXPO in Seville, Spain. The cooling tower used evaporative cooling to create comfortable spaces at the EXPO. Water was sprayed down a tower that caused the air to move downwards while cooling it. I wanted to incorporate this system into design of the lower complex. I later found that direct exposure to such wet conditions inside a building could cause diseases and fungi. I therefore needed to separate the moisture from the user or inside of the building. It led to the design of a machine put in the atrium that pumps the water from the cool source or heat source but separates the water from the outside. This surface would become the mechanism to transfer heat from or to the water. The third development was to extend the distance of which the air would be in contact with the heating or cooling source. The simple solution was to let the air run through a series of fins connected to the heating or cooling source extending the distance and time of exposure.

The cooling of air the heat exchanger causes condensation and loss of moisture from the air distributed into the spaces. The incorporation of 'green' partitioning walls into the layout of the lower complex replaces the lost moisture content and improve, partly filtering, the air quality. These partitioning walls are placed, where applicable, in the hallways of the lower complex to enable access to sunlight filtered through the sky-roof structures

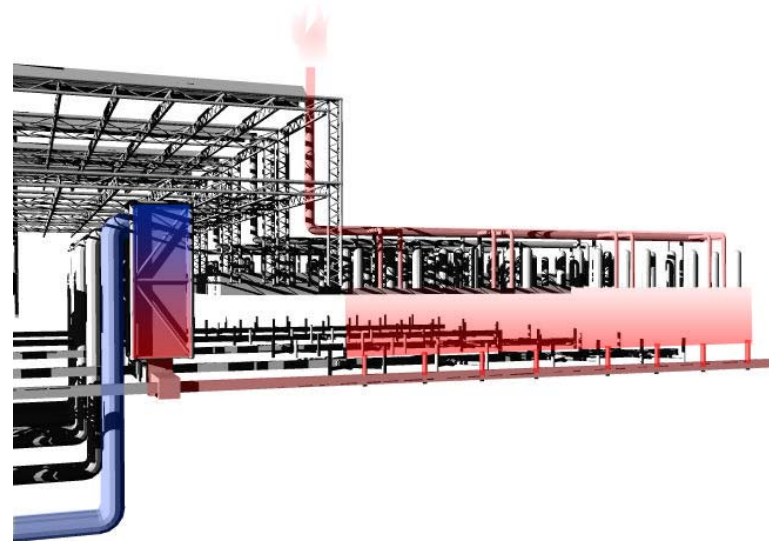


Fig 24: System of Lower complex

### OFFICE COMPLEX

The office complex heating and cooling system is much simpler and derived from a passive design system. This system works on the basis of accumulating cool air from the cool side of the building and hot air from a buffer zone placed on the northern side. Air is heated through the greenhouse effect in this buffer zone and distributed through the office space. 'Green' wall structures are placed in these buffer zones to help with the cooling, filtering and improvement of air quality in the office space. The creeper used in both the lower complex and office block has low maintenance requirements.

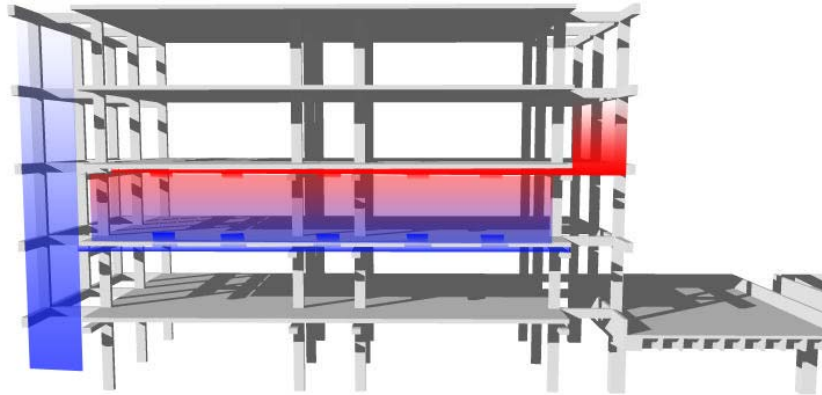


Fig 25: System of Office Complex

### WATER SYSTEM

One of the advantages of the aquifer already mentioned is its filtering capabilities. This filtering process would only be applied to water used in the irrigation system. Clean water can be harvested and the aquifer replenished with old water used for irrigation. The system links with the above mentioned ones. An objective of the project was to link all the systems with each other making them inseparable and minimizing their energy requirements.



### 3 LIST OF SOURCES

Bentley, I. Alcock, A. Murain, P. McGlynn, S. Smith, G. Responsive Environments, A Manual For Designers.

Dewar, D. Uytendogaardt, R. S. Creating Vibrant Urban Spaces.

Givoni, B. 1998. Climate considerations in Building and Urban Design. Van Nostrand Reinhold.

Swart, G. 2003 Sept/Oct. Peter Buchanan- A gracious 'architect' of architectural criticism. Leading Architecture and Design.

Yannas, S. 2001. Towards More Sustainable Cities. Elsevier Science Ltd.

