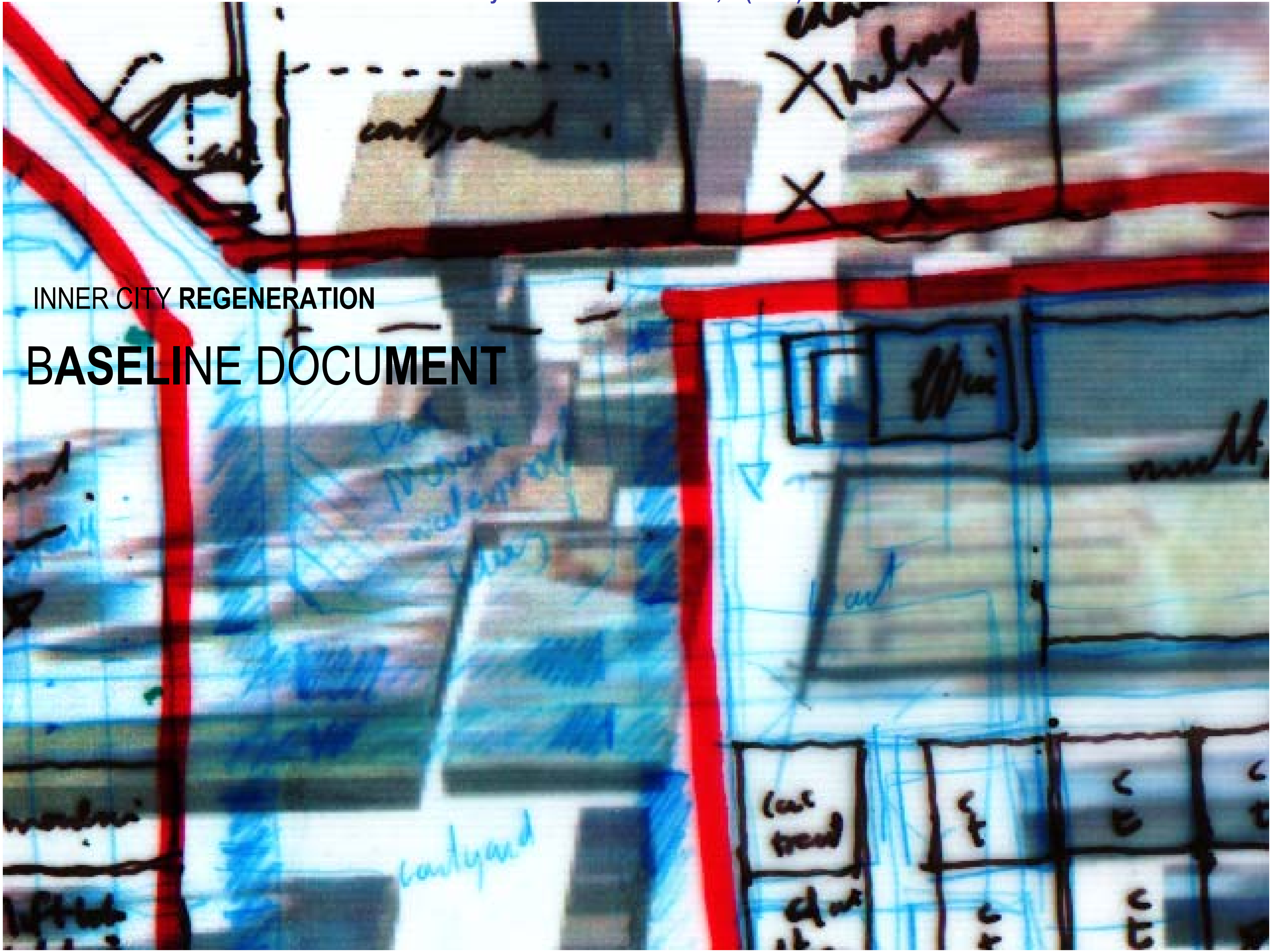
INNER CITY **REGENERATION**

BASELINE DOCUMENT



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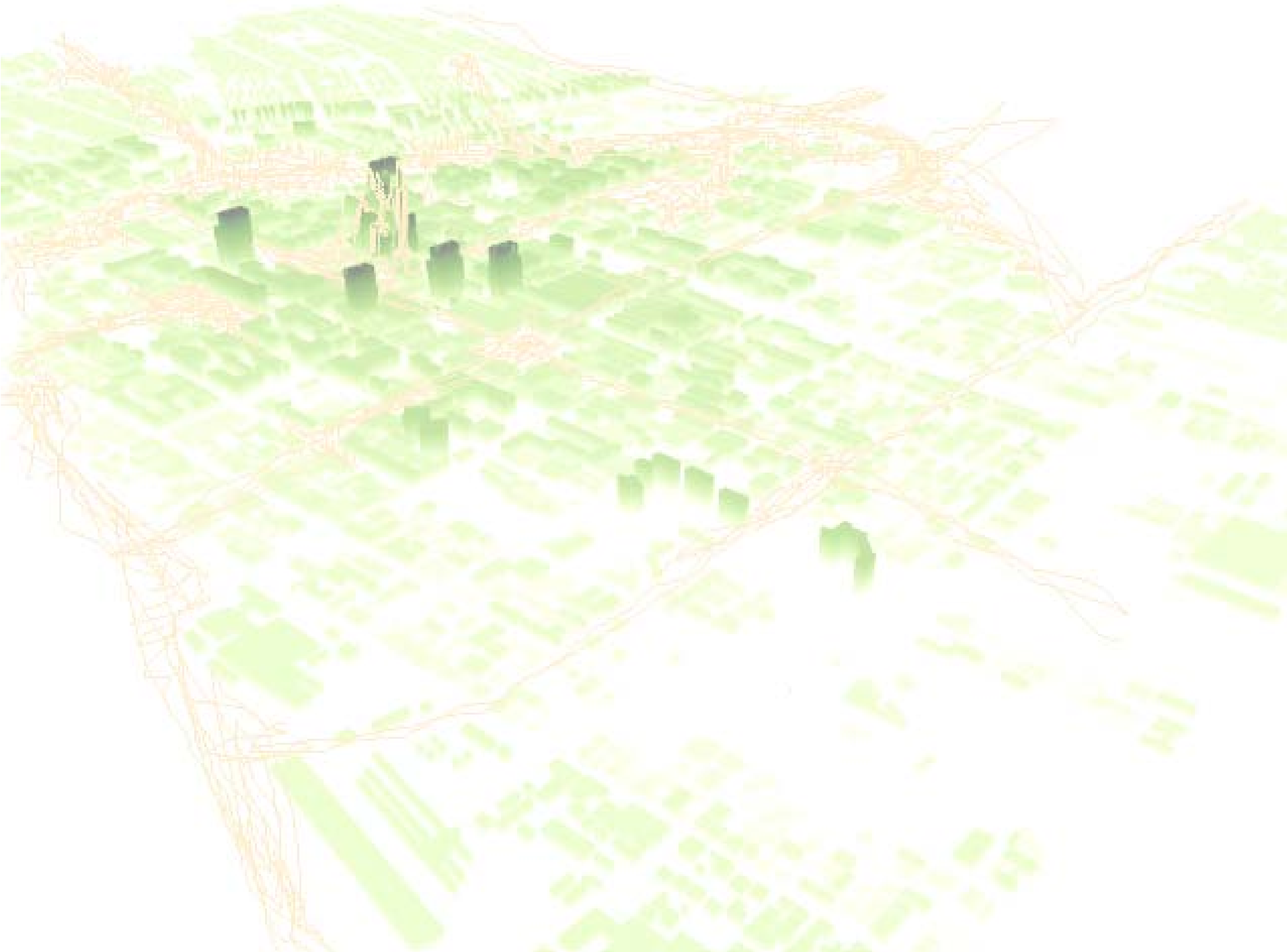


1 URBAN VISION

1.1 URBAN REGENERATION

Tshwane Inner City is a city disconcerted by problems such as:

- Segregated city planning in Pretoria's past history.
- Dilapidating urban fabric
- Lack of economic and social support in some areas
- Crime
- Air Pollution and the green house effect (so far only to a small degree)
- Excessive vehicular traffic causing traffic congesting in the Inner city. This leads to a higher demand in unnecessary parking space and aggravation of the heat island effect.

1.1.2 Direct approach

What is usually witnessed with urban development is the slow incorporation of design frameworks composed by city planners, urban designers, architects, landscape architects etc. The problem is that this method of urban improvement is only an implementation tool for future developments to incorporate into their design. They do not necessarily take place in the near future but only implemented years after by a development. Sometimes a delayed reaction can be too late.

1.1.3 Inner City Regenerators

Fig 1: Urban Regenerators in the CBD

ICR's refers to 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 only 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.

The idea can further be explained by comparing it to a natural fountain.

If a fountain originates, fauna and flora flourish.

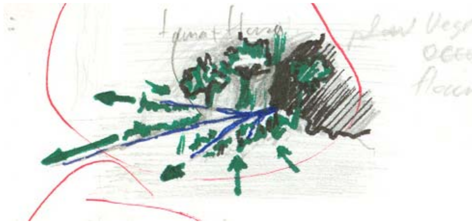


Fig 2: Fountain

But only because a fountain provides what is needed.

Life surrounds it and stays close to it.

Sometimes this source of life forms an artery and connects with another artery.

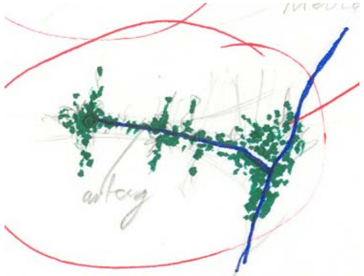


Fig 3: An artery

Life also surrounds these arteries.

Although you can not compare the urban environment with the biological environment, I think it can metaphorically be embodied in a manmade structure whose only function is to fulfil the needs of the context that surrounds it (social, economic, environmental needs). It can also become a place where growth occurs, where human life move through and stays.

Not all of the Inner City is in a dilapidated state so urban regenerators are not needed everywhere in the city (not affordable anyway). Therefore these regenerators must be placed at strategic intervals to accommodate for current problems and for future problems that may occur.

As mentioned before these regenerators are not design parameters which future developments have to integrate into their design, it is an immediate/direct placement of a function that controls and diverts energy to heal the social, economic and environmental problems that surround it.

Regenerator placed

This leads to certain wanted activities and further development.

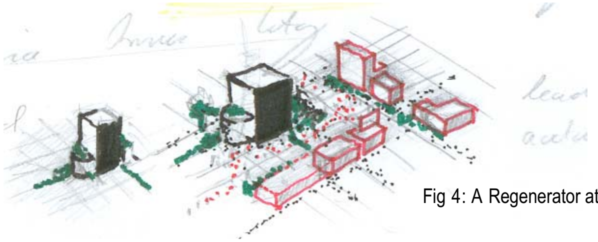


Fig 4: A Regenerator attracts

If this generator connects with another,

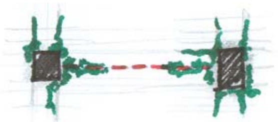


Fig 5: Connection of Regenerators

An artery is formed.

Fig 6: An urban artery is formed

These systems of urban regeneration attract activity not only from other parts of the inner city but from areas outside it. It therefore strengthens the City of Tshwane as a tourist, cultural, historical, economical and political backbone of Gauteng.

1.1.4 Biological environment

I have described the importance of the inner city and the possibilities of urban regeneration, but not the importance of the ecological infrastructure that has to be incorporated into these regenerators. The protection of our biological environment is very important for it contributes to physical and emotional needs of people and to the global ecological well being of mother earth.

Addressing ecological threats is thus an important requirement of a regenerator:

Improve natural eco-systems in the city.

Relieve strains on resources through sustainable development.

Improve carbon dioxide and oxygen levels.

Relieve heat island effect

CHAPTER 2
SOCIAL ISSUES

2 SOCIAL ISSUES

2.1 OCCUPANT COMFORT

One of the aims of the Urban Regenerator is not only to create comfortable spaces, but to establish an attractive and unique place at urban and human scale. The quality of this environment in and around the building will contribute to the health, physical- and psychological comfort of the user/occupant, but it needs to be achieved with minimal cost to the environment.

2.1.1 Lighting

Lighting accounts for a major part of the energy use in commercial buildings, both directly and also indirectly - if the building is mechanically ventilated or cooled - through the additional cooling load imposed by the heat given off by the lights. Daylight directly displaces the electricity used by the artificial lights and because sunlight has better ratio of light to heat than artificial lights, it has the potential to reduce the cooling load. [Roaf & Hancock, 1992. p46]

The sun will be main source of lighting used in the Urban Regenerator (during the day of course). Mechanical lighting will be the secondary source and the artificial lighting controls aims to vary the amount of light in such a way that the combination of daylight and artificial light is just sufficient to provide the desired illuminance. [Roaf & Hancock, 1992. p46]

2.1.2 Lighting techniques:

A- Natural lighting will be acquired by lifting the roof to the required height and give the roof edge an overhang for summer sun.

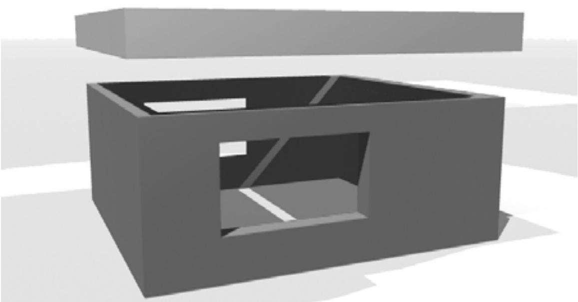


Fig 7: Natural lighting.

B- Natural lighting in the multi-floor office complex will be acquired from the northern and southern facade.

Light sources

The prime measure of efficiency for a light source will be the ratio of the light emitted to the power input. Manufacturers are constantly attempting to increase this ratio and designers are trying to keep abreast with corresponding low-energy schemes that use less power to provide the same illuminance, i.e. lumens per square meter of lighted area, expressed as lux. [Thomas, R. 1996. p107]

Type of Spaces:

1. Office type: 500 lux
   Primarily; natural lighting. Prevention of glare will be applied where necessary.
2. Specialising type (Treatment rooms): 500 lux
   Artificial lighting will primarily be used to maintain an important ambient lighting with the help of natural sunlight.
3. Meeting and conference type: 100-750 lux
   Both natural and artificial lighting will be applied to this type of space depending on the importance of the activity it hosts.
4. Storage type: 150 lux
   Although these types of spaces are not frequently visited, natural lighting will be applied depending on the sensitivity of the material it stores.
5. Paperwork type (Printing/copying): 300 lux
6. Computer type: 500 lux
7. Natural lighting has to be controlled so that glare from the computer screens is reduced.
8. Reading type: 500 lux
9. Use of natural and artificial lighting
10. Waiting and relaxing type: 150 lux
    Special lighting is not needed here but, an opportunity to play with different lighting effects.
11. Ablution type: 150 lux
    People prefer to see what they are doing in these types of spaces.
12. Working type: 500 lux
    These include workshops and studios. The more natural light the better.
13. Circulation type: 100 lux

[Tutt, P. and Adler, D. 1998. p413]

Controls can provide a much needed element of personal influence over one's working environment. One approach is to be able to dim the lights as this can help with certain glare problems as well as reduce energy consumption.

A second very flexible approach is to provide background lighting to, say, 200-300 lux and then use adjustable personal task lights to increase this level as necessary. Energy efficiency is, of course, improved if these lights are turned off when they are not needed. [Thomas, R. 1996. p109, 109]

Guidelines

1. Most people prefer daylight.
2. Ensure that the average daylight factor is adequate.
3. Ensure sufficient uniformity of daylight.
4. Remember that day lighting systems do not increase the amount of light – they simply redistribute it.
5. Direct sunlight from all azimuths and altitudes must be considered.
6. Consider use and maintenance.
7. Use high efficiency fittings.
8. Use appropriate control systems.

[Thomas, R. 1996. p109, 110]

2.1.3 Ventilation and Thermal Comfort

Although passively designed, the HVAC systems will be mechanically assisted. It will be in the form of reversible extractor fans placed in areas where the natural movement of air are sometimes inadequate. The physical heating and cooling of the air will be achieved by passive systems.

Three basic systems (natural+ mechanical) will provide the ventilation and thermal comfort for the users of the building.

1. Fresh air ventilation system

   Lower complex

   The source of ventilation is at the core and east side of the lower building.
   So far 8 inlets situated throughout the building.
   The largest area one inlet has to ventilate is 432 m2.
   At most, one person would occupy 4 m2.
   That means a maximum of 108 people has to be catered for by one ventilation inlet.
   At a minimum of 8 l/ per person, one inlet must be able to extrude an air stream of 864 l/s (0,864 m3/s).
   That means the source of the ventilation must acquire airflow of 6912 l/s for the whole lower building.

   Office complex

   The required ventilation for the office complex will be achieved by natural cross ventilation.

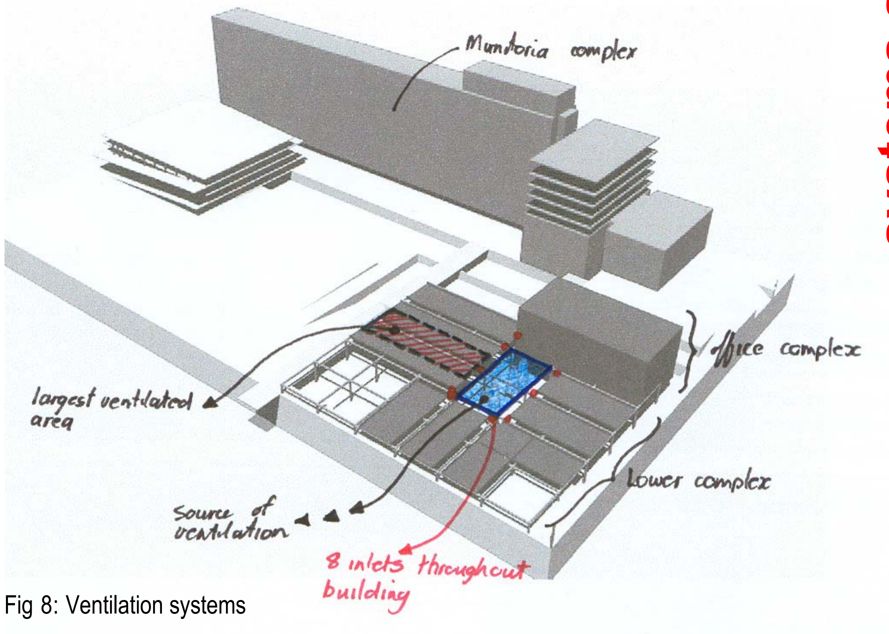


Fig 8: Ventilation systems

systems and calculations have changed (see technical report)

2. Air heating system

   The air heating systems will be based on air type collectors. Basically this system entails cool air moving over a heated surface in an insulated air type collector. This system will be used in both the office complex and the lower compl ex.

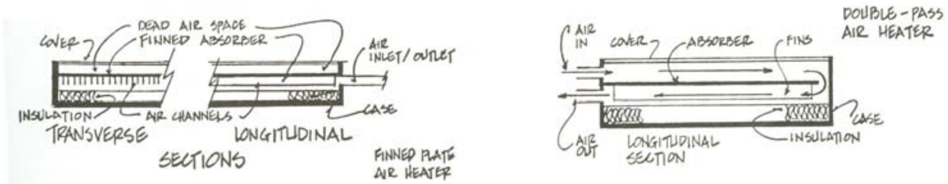


Fig 9: Air type collectors for passive air heating system.

3. Air cooling system

   The air cooling concept is derived from the cooling tower idea: The air inlet is situated outside. The first stage of cooling the air is letting it move through the water storage tank. It then passes the cooling tower without the water coming into contact with the water. (Wet indoor environments causes bacteria and diseases like legionella; the public agrees that they don't want legionella)
   The fine spray of water draws heat energy from the surface. On the other side of the surface is the flow of air that cools down (because energy is drained from it) and is used to ventilate the lower complex.
   Air-cooling in the office complex will be achieved other means of evaporative cooling. The cool air will move from the southern side to the north through each floor of the building.

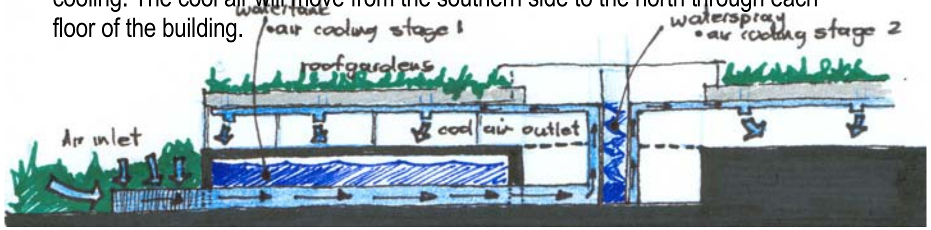


Fig 10: Passive design cooling system

Psychological adaptation as a means to comfort and guideline to designing urban spaces

Different people perceive the environment in a different way, and the human response to a physical stimulus is not in direct relationship to its magnitude, but depends on the 'infor-mation' that people have for a particular situation. Psychological factors are therefore influencing the thermal perception of a space and the changes occurring in it, as described below. [Nikolopoulou M, Steemers K. 2003. p97]

Naturalness:

This is a term describing an environment free from artificiality, whereby there seems to be increasing evidence that people can tolerate wide changes of the physical environment, provided that they are produced naturally. [Nikolopoulou M, Steemers K. 2003. p97]
Surrounding the building with natural vegetation not only balances oxygen and carbon dioxide levels but adds to the level of comfort.

Expectations:
Expectations—that is what the environment should be like, rather than what it actually is—greatly influence people's perceptions, such as in naturally ventilated buildings, where people expect variations in temperatures, both temporally and spatially, whereas, in air-conditioned spaces they expect a much more stable thermal environment. [Nikolopoulou M, Steemers K. 2003. p97]
The use of a passive heating, cooling and ventilation system will cause the users to expect variations in the temperature and therefore tolerate it more.

Experience:
Experience directly affects people's expectations and can be differentiated in short- and long-term. Short-term experience is related to the memory and seems to be responsible for the changes in people's expectations from one day to the following.
Long-term experience is related to the schemata people have constructed in their minds, determining a choice of action under different circumstances. [Nikolopoulou M, Steemers K. 2003. p97]

Time of exposure:
Exposure to discomfort is not viewed negatively if the individual anticipates that it is short-lived, such as getting out of a warm car to enter a building in winter, and no significant dissatisfaction is caused. This is a critical factor for external spaces, which apart from movement, they are mainly used for recreational activities, and people modify the time they spend outside, according to their needs. [Nikolopoulou M, Steemers K. 2003. p97]
The use of a parkade instead of placing the parking underneath the building will only cause temporary discomfort which can be tolerated. At night the remaining building users can relocate their parked cars to the parking space below the office complex.

Perceived control:
It is now widely acknowledged that people who have a high degree of control over a source of discomfort, tolerate wide variations, are less annoyed by it, and the negative emotional responses are greatly reduced. [Nikolopoulou M, Steemers K. 2003. p97]
Ensuring that users will always have control over their environment makes them tolerate more inconvenience than usual.

2.1.4 Noise

The largest source of noise is on the corner of Proes and Vermeulen Street. The noise is caused by traffic and people.

According to Regulations, noise is considered to be disturbing if the total noise level in dBA (ambient plus intrusive) exceeds the ambient level in dBA by 7 dB or more (i.e. if the intrusive noise causes the ambient noise level to rise by 7dBA or more). [B.G. van Zyl]

Due to the nature of the garden roof that covers all the spaces of the lower complex there is no need to apply special noise insulating techniques to the roof of the lower complex except for the windows.

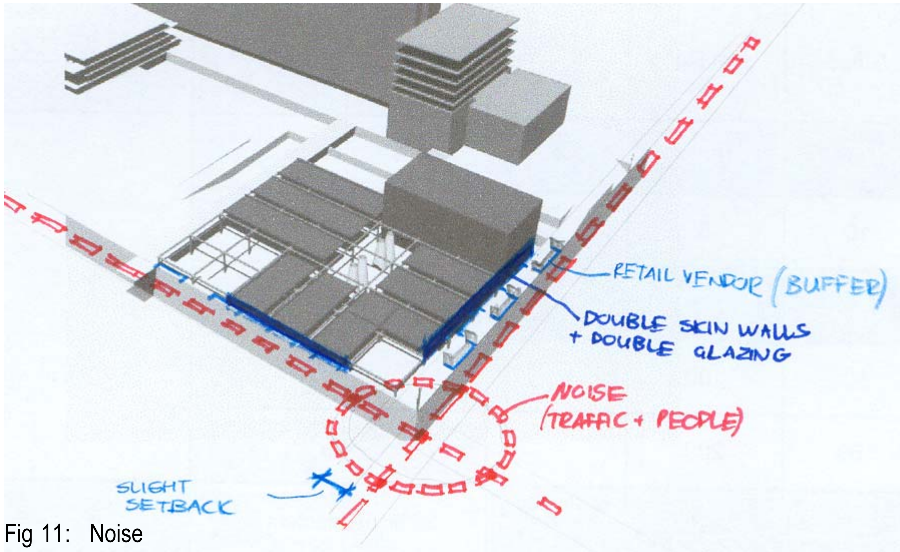


Fig 11: Noise

The walls on the western and northern side of the lower complex have to be insulated from the noise that is produced from Proes and Vermeulen Street.

The retail vending stalls facing these facades have to be specifically designed to serve as a buffer from the noise generated by these streets.

Double skinned walls constructed to face the streets to bring down the noise level to the required level. The wall's thickness and density play an important role. A good example of a material is unplastered brick wall.

Double skin glazing will only be applied to windows where the specific spaces require a low noise level. This will probably be some of the window facades facing Proes and Vermeulen Street.

The lower complex will be set back a few meters to allow for retail vending stalls to be constructed. This setback will slightly reduce the sound level due to attenuation in the atmosphere.

In critical areas a panel absorber will be incorporated into the design.

Trees provide little attenuation to sound and they are not relied on to bring down the noise level.

2.1.5 Views

The multi storey office complex will have views to the natural surroundi ngs in the north and to city life in the south. The lower complex restricts users view, but the nature of the complex will create comfortable and natural spaces.

Fig 12: View to the north

2.1.6 Indoor Outdoor Connection

There will be an plenty of access to different types of green spaces (inside and out) due to the nature of the development.

- Urban park
- Atrium
- Roof gardens

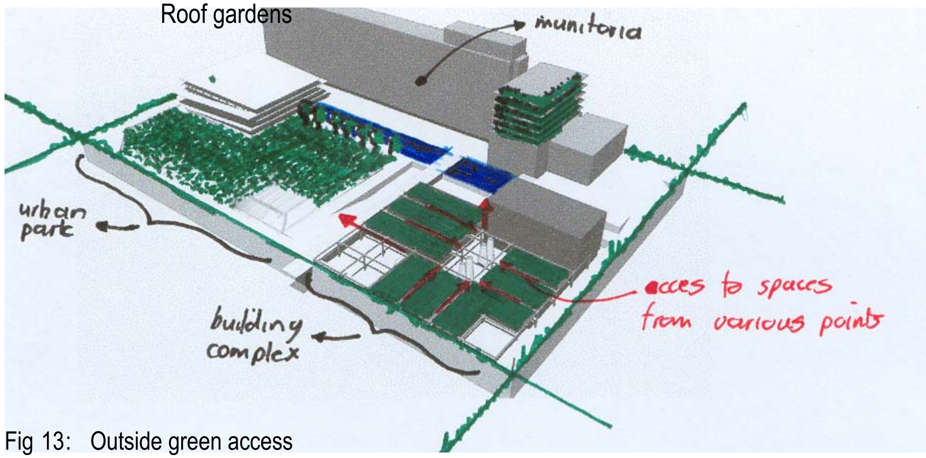


Fig 13: Outside green access

2.2 INCLUSIVE ENVIRONMENTS

The building hosts a variety of facilities all which will be shared with other institutions/companies or community groups:

- Computer facility
- Conference centre
- Multi-functional facility
- Lecture Hall
- Workshop
- Small library

2.2.1 Public Transport

Taxis and busses are accessible within 100 metres. These facilities will be accessible by wheelchair. A large taxi rank is located 320 metres from the building and Belle Ombre station is located 1, 5 kilometres.

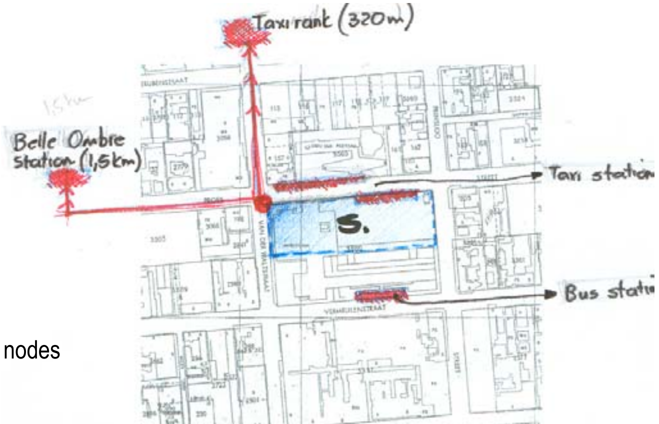


Fig 14: Public transport nodes

2.2.2 Routes, Changes in level and Edges

All surfaces of each floor in the complex are at the same level. Adequate ramps are placed at entrances and don't exceed a fall of 1:12.Vertical access to the office complex is either by stairs or lifts (also accessible to disabled).
Edges between walls and floors and the nosing of steps are clearly distinguished for user safety. Special provision is made for disabled parking which is placed below the office complex.

2.2.3 Toilets and Kitchens

The required number of toilet facilities will be provided including one or more WC pans suitable for use by persons in a wheelchair.
Air requirements for toilets: 20 l/s per bath, shower, WC pan, urinal, stall or 600 mm of urinal space. [SABS 0400. 1990. p113]
Air requirements for kitchens: 17, 5 l/s air supply required per person. [SABS 0400. 1990. p112]
The ventilation outlet of toilets and kitchen will be separated from the rest of the ventilation systems.
Toilets are located at the southern end of the lower facility which links with the services shaft of the office complex.
This placement allows all waste produced by these facilities to be collected and recycled. It also provides better ventilation away from the system that provides air for the lower and office complex.

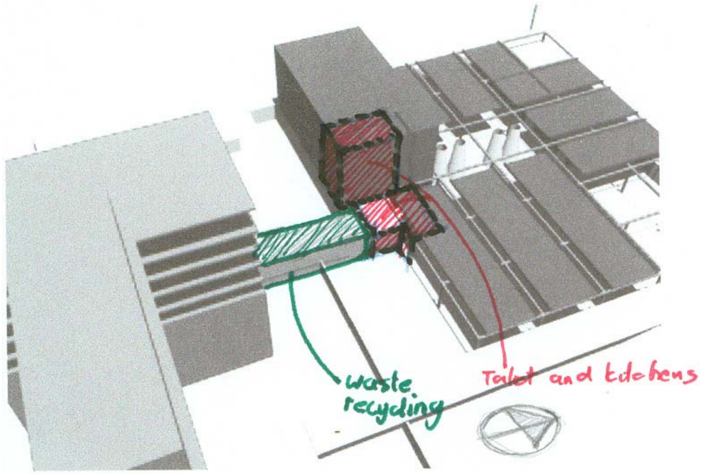


Fig 15: Position of toilets, kitchens and services

2.3 ACCESS TO FACILITIES

Providing access to most of the building users daily life necessities increases efficiency and reduces environmental impact.

2.3.1 Childcare
The complex does not include childcare, but will be provided close by. A certain amount of money will be granted to the childcare facility if the complex doesn't fulfil the requirements of the building occupants. The educational/skills-training facility will provide assistance to help with the schooling of the children.

2.3.2 Banking
Banking services are not provided on site, but various and quite a number of banking facilities are located nearby.

2.3.3 Retail
It will be ensured that the vending and market stalls on and alongside the site will provide products needed on a day to day basis.

2.3.4 Communication
Telephone booths will be located on site. E-mail facilities are provided in the Educational/skills training centre. Handling of post will be controlled by the mail room situated inside the office facility.

2.3.5 Residential
Housing is located well within 12km of the site.

2.4 PATICIPATION AND CONTROL

Most of the systems which affect the building users will be controlled by both the user and the building maintenance team hoping to ensure psychological and physical satisfaction. Large scale adjustments, like reversing systems, will be controlled by the building maintenance team.

2.4.1 Environmental control
Users of the building will have control over their environment; this includes the changing of thermal temperatures, ventilation flow (opening of windows) and adjustments made to lighting.

Thermal control:

Outlets of the thermal air collectors will be adjustable by users by means of a simple device which is easy to access.

Control over the cool air inflow will be adjustable at the source and the outlets of this system.

Ventilation:

Ventilation will be controlled in various ways including opening of windows and the setting of extractor fans in certain areas.

Lighting:

Flexible artificial lighting is an option.

Removable and adjustable blinds will be provided.

2.4.2 User adaptation
The structure of the lower complex allows for an open space floor plan. It also allows for the removal or moving of some of the walls to accommodate the changing of spaces throughout the lifespan of the building.

The furniture provided will allow a variety of options for the user to change or personalise their space.

2.4.3 Social spaces
External:

Various landscaping detail and furniture will be provided around the complex and in the park to allow for social interaction, especially along frequently used routes.

Internal:

Seating along internal routes will be provided especially around the core area. A lounge and cafeteria will offer enough opportunities for the users to interact.

The multi-functional hall will cater for more formal functions.

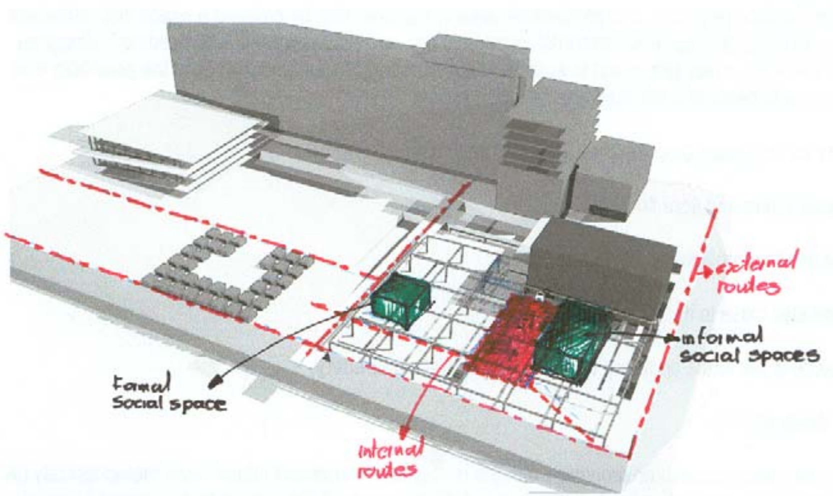


Fig 16: Inside and outside social spaces

2.4.4 Amenity
The kitchen and cafeteria will provide refreshments for the whole complex. A vending machine will offer snacks and refreshments for late night occupants.

2.4.5 Local community

Community involvement:

Due to the nature of the project (urban regeneration) it is crucial that the community participates in the different projects that will be offered in the complex. This will ensure the success of one of the main functions of the project namely: social regeneration.

Various spaces and services will be available to the community:

- Computer lab – Part of educational project
- Market – Creating economical opportunities for community
- Workshop – Skills transfer
- Lecture Hall - Part of educational project
- Conference centre
- Multifunctional Hall
- Library
- Office facilities (special circumstances)

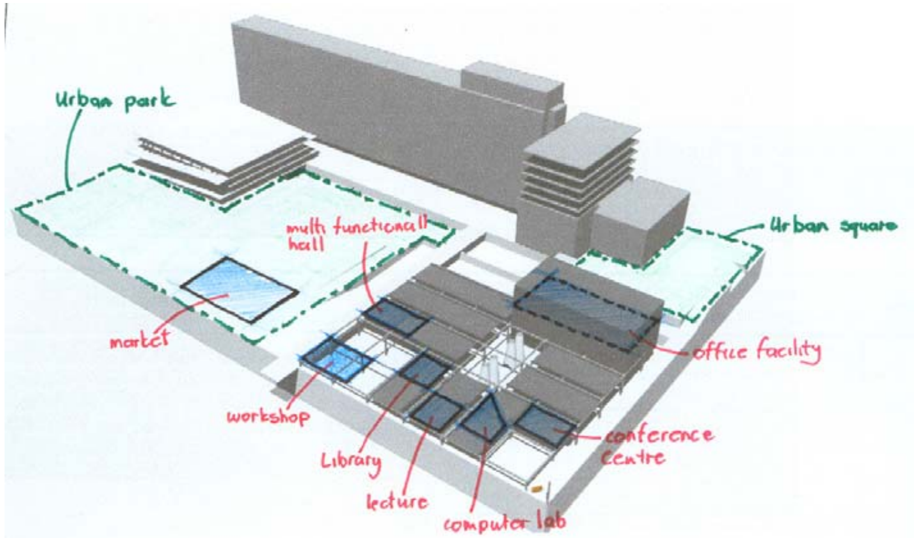


Fig 17: Shared facilities and spaces

2.4.6 User manual/training

The building consists of various functions and systems, all of which have to be managed and taken care of to ensure the project functions effectively.

The maintenance team will consist of:

- Terrain maintenance (natural environment)
- Systems maintenance.
- Building and Project maintenance.

During the design process and construction stages the designing consultants will create an effective and comprehensive user manual. They will also be responsible for training and informing the maintenance team during the design and construction stages. Their expertise, if necessary, will be used for a certain period after construction has been completed.

2.5 EDUCATION, HEALTH AND SAFETY

The main purpose of the Education and Healthcare facility is to ensure the well-being, development and safety of not only the community but for building users as well. Projects in conjunction with surrounding institutions will help ensure this goal. The complex will house various economical development projects not only to help community members to become economically independent but to help building users and maintenance staff to excel and progress at their careers.

2.5.1 Education

Access to support for learning provided:

- Internet access/Computer courses – Computer lab
- Structured courses – Lecture hall, Multifunctional facility and Conference room.
- Learning material – Library.

2.5.2 Security

Measures taken to ensure that areas in and around the building are safe and feel safe:

- Well lit routes
- Clear visual links between spaces
- Small dark corners avoided
- Overlooked areas
- Uses of complex after hours ensure constant presence of people.

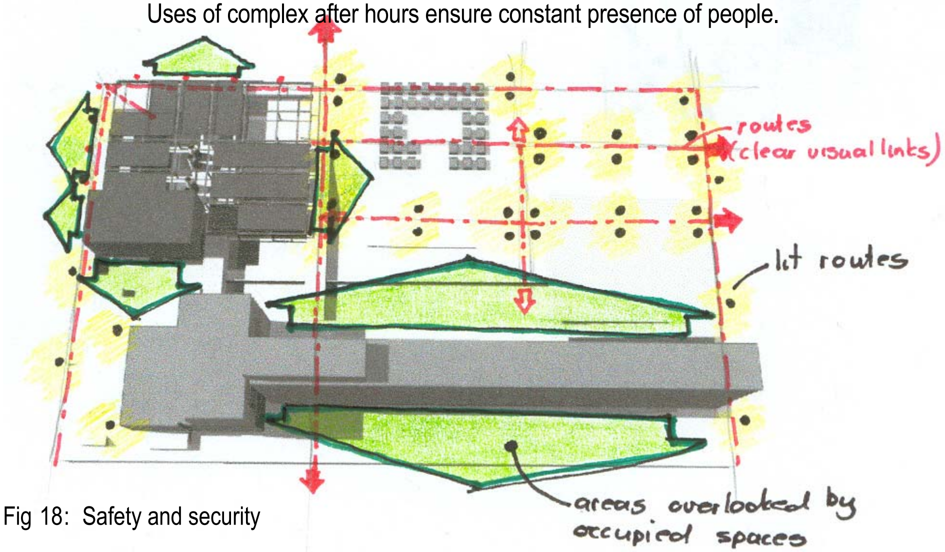


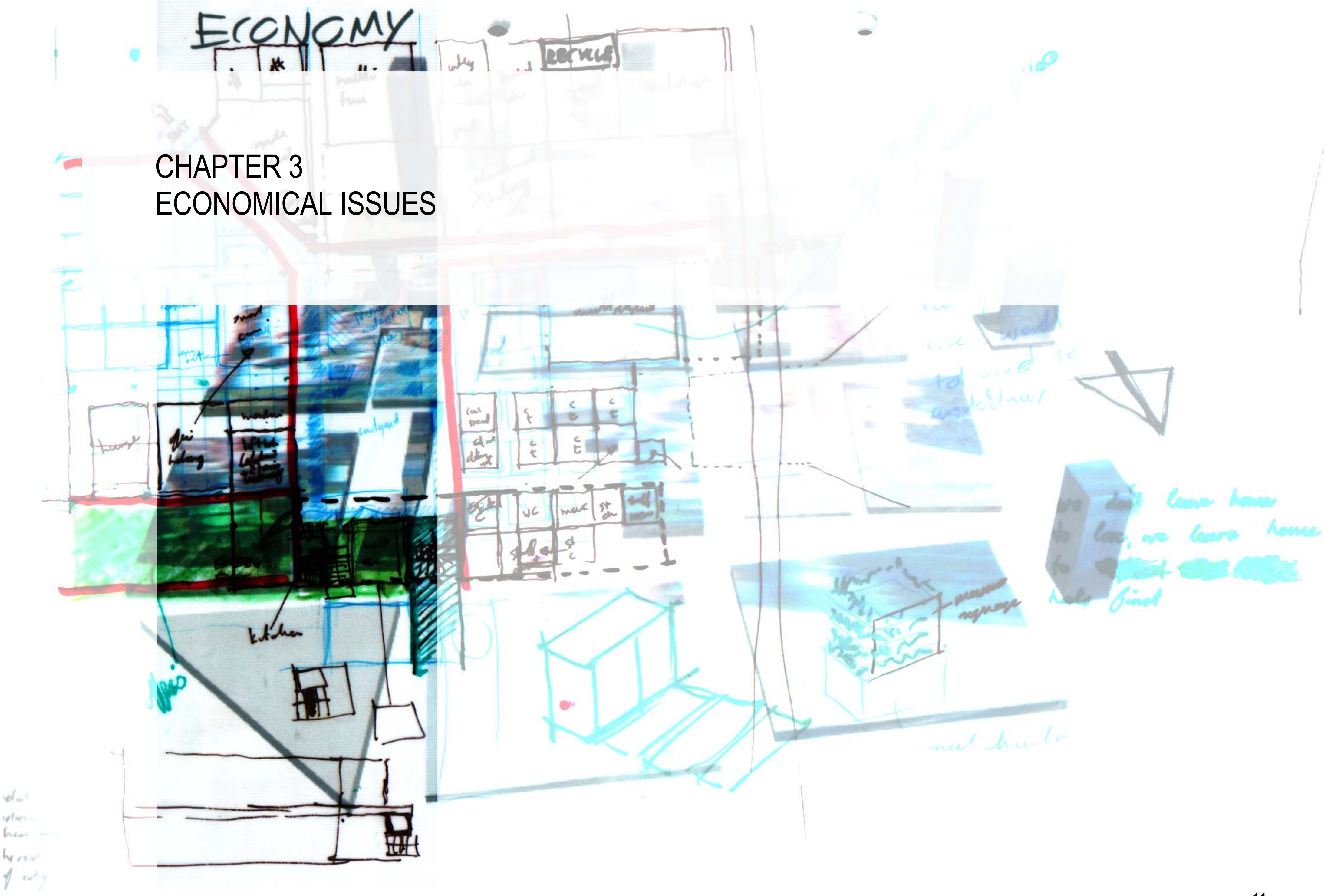
Fig 18: Safety and security

It is the health care facility's responsibility to care for a healthy environment in the building. They will constantly make the users aware of the health status of the building's environment.

There will be no smoking inside the building.

The building complies with all health and safety requirements

The Healthcare facility's main focus will actually be to concentrate on the health status of the surrounding community and assess the problems that occur by holding campaigns.



CHAPTER 3
ECONOMICAL ISSUES

3 ECONOMIC ISSUES

3.1 LOCAL ECONOMY

Improving local economic circumstances of the surrounding community is another focus of the project. This has to be implemented during and after the construction process.

3.1.1 Local contractors

Most of the construction will be carried out by local contractors.

Contractors found in and around The City of Tshwane:

Construction

Bird Construction (Pty) Ltd
Ellinas Tzircalle Building cc
Makhosi Projects (Pty) Ltd

Civil Engineering

Burchell Konstruksie Bk
Dekker & Gelderblom
Engkon Construction cc
Gast International (Pty) Ltd
Level Construction co (Pty) Ltd
Radon Projects (Pty) Ltd
Vibro Projects (Pty) Ltd

Landscaping

Abacor
Aquamulch cc
Boskoop Nursery
Design & Plant
Engadini Landscaping
Hydro Scapes cc
Magenta Plant Distributors
Over the Garden Wall
Plant Parade
Technikon Pretoria

Irrigation

Greenhills Landscaping
Irrigate

3.1.2 Local building material and component supplier

Available local material and component manufacturers will be the suppliers for the development. Materials and components not found nearby will be avoided as far as

3.1.3 Outsource opportunities

Security, cleaning and catering of various functions and activities will be contracted to different small emerging businesses.

3.1.4 Repairs and maintenance

Repairs and maintenance required by the building will be handled by the maintenance team that is trained to offer technical support. Specialists will be contracted to repair problems which the maintenance are not able to control. Specialists in 200km of the site are preferred over those exceeding the distance, if used at all.

3.1.5 SMME support

The project will support small market development along the streets by providing structured vending stalls. There is even a proposed small market in the urban park which will be occupied by vendors from a struggling economical background and students from the skills training centre practicing their entrepreneurial skills.

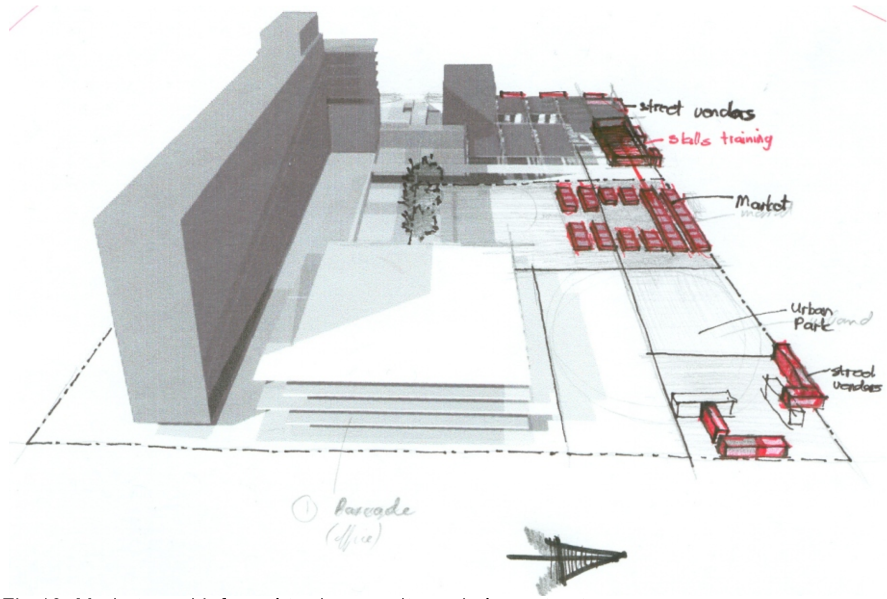


Fig 19: Markets and informal traders on site and along streets

3.2 EFFICIENCY OF USE

Constant use of the complex during and after hours supports sustainability by reducing waste and the need for additional buildings

3.2.1 Usable space

Non usable space such WCs and circulation are kept to a minimum. The space that system-plants will take up will be a little more than it is supposed to be, but the main purpose of most of these plants is focused on creating free energy that justifies the amount of space it occupies.

3.2.2 Occupancy

Some spaces such as the educational facility will be occupied for an average of 70 hours a week

Healthcare facility: average of 50 hours a week

Offices: average of 45 hours a week

3.2.3 Space use

The offices, healthcare and educational facility will share spaces and equipment to help reduce cost and the repetition of large spaces in the building.

3.2.4 Use of technology

Technologies are used to reduce space requirements and to increase the effectiveness of the functions the projects has to achieve.

The choice of technological instruments depends on:

- The company's green record
- The level of embodied energy

Spaces which will make use of technologies

- Computer Lab
- Conference room
- Offices
- Library

3.2.5 Space management

A policy will be implemented to ensure that space is well used:

Schedule

3.3.2 Internal partitioning and structure

Internal partitioning of the lower complex will be free from structural responsibilities as the space-roof system and the structure of it will carry the roof's weight. This enables the free placement of internal partitioning. The office complex structure will not be the same as that of the lower complex. Its concrete based structure cannot span the distances of the space-frame and will therefore limit office spaces to a certain extent, but internal partitioning will still be structurally free.

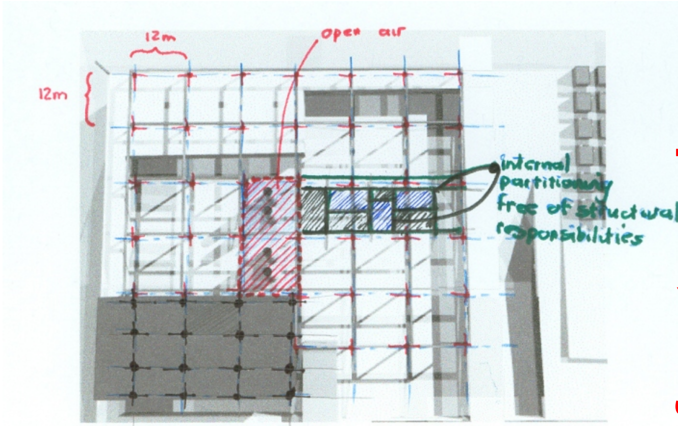


Fig 20: Partitioning and structure

roof system changed to concrete structure (see technical report)

3.3.3 Services

Easy access provided to electrical, communication and HVAC where appropriate in each usable space. Provision should also be made to allow for alteration of these services. [Gibberd, J. 2002.p9]

3.4 ONGOING COSTS

3.4.1 Maintenance and cleaning

To ensure low maintenance and low maintenance cost, material selection is based on life expectancy.

Areas which require frequent maintenance will be easy accessible.

Windows and services in the roof are not specifically easily to reach, because of the height requirement, but definitely accessible either from inside or from the roof.

3.4.2 Security and care taking

Factors decreasing the requirement and cost of security:

- Mixed use development
- Areas in park are overlooked by Munitoria occupants and the office complex.
- Constant presence of people in the urban park.
- Entrance and exits are minimized and controlled.

3.4.3 Insurance / water/ energy/ sewerage

Cost of energy, in its various forms, in the systems and other applications will be monitored. A policy will be implemented to reduce and remind building users of energy use and waste management.

Sewage will be recycled for energy harvesting. This reduces waste and a fertiliser is available for the various areas of plant growth in and around the site

Water will be harvested in various ways from rooftops and the park and stored in a designated area beneath the lower complex. This will reduce the water demand, but users will still be frequently reminded of minimising water consumption.

3.4.4 Disruption and 'downtime'

The heating and ventilating systems can be accessed from rooftops and circulation areas

So far the backup energy system is a CHP plant generating power from sewage attained from all the buildings on site. The energy generated by the CHP plant is fed into the grid at its first stage. When power failure occurs the plant's energy will then be used

3.5 CAPITAL COST

By ensuring cost effectiveness, accommodation and services provided in the building can be accessible to low income community members as well.

3.5.1 Consultant fees

Consultant fees are not just calculated on total project cost basis, but incentives provided to consultants to reduce capital cost and ongoing costs. [Gibberd, J. 2002.p10]

3.5.2 Build-ability

The building's form is simple with replication of structural systems in various parts of the building:

The roof structure of the lower complex.
The floor system of the multi-level office complex
Parts of the façade of the multi-level office complex.

Local material will be used as far as possible.

3.5.3 Construction

Construction approach designed to reduce the initial capital cost of the building. [Gibberd, J. 2000.p10]

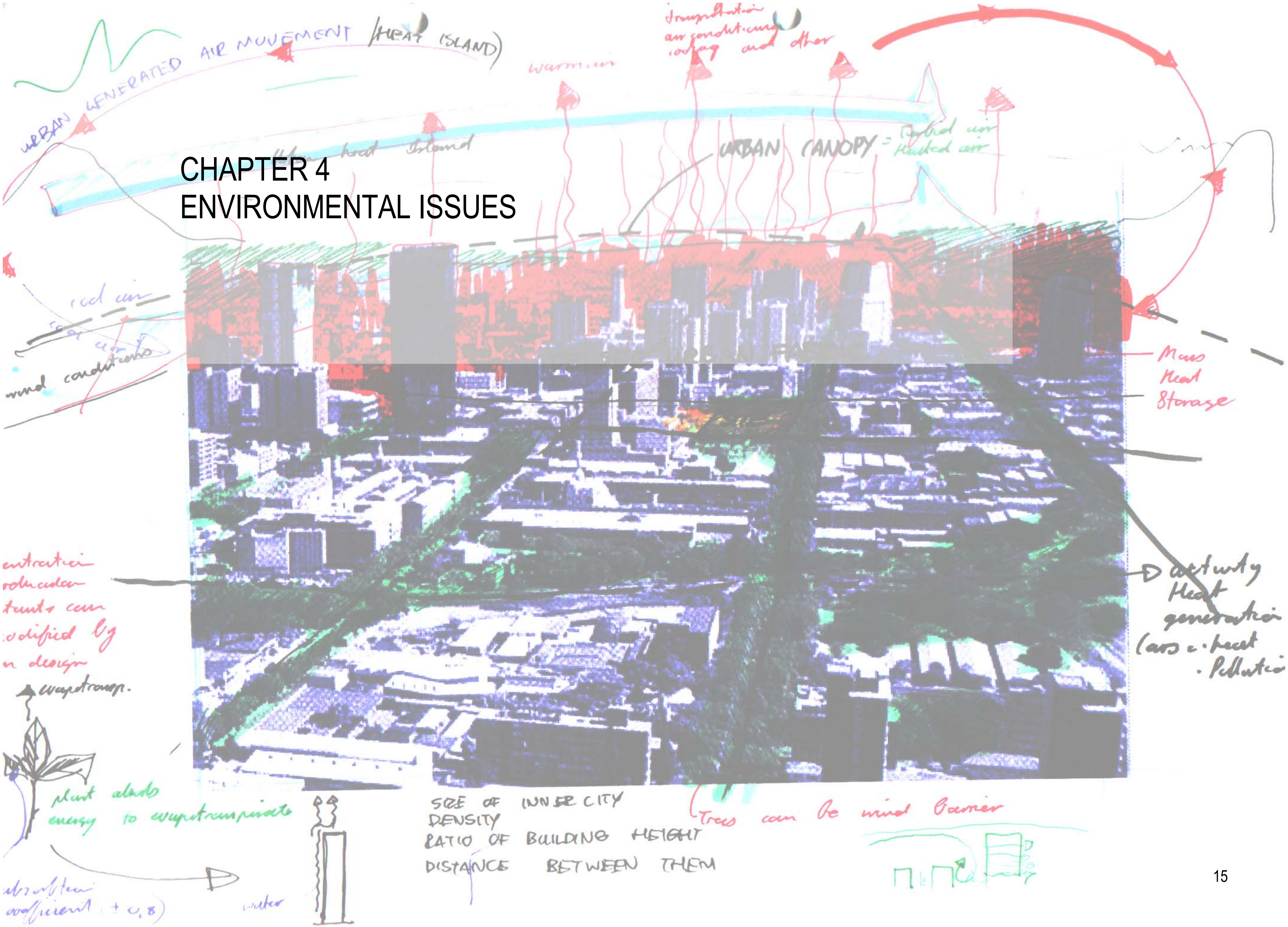
The project can be completed in a series of phases:

1. The centre would be constructed first
2. The parkade
3. Urban landscaping
4. Markets and street vending

3.5.4 Shared costs and sharing arrangements

Certain amount of cost can be shared with other users like the surrounding companies that would be interested in using/sharing some of the facilities. Arrangements will also be made with surrounding buildings to make use of some of the facilities that they have to offer.

CHAPTER 4
ENVIRONMENTAL ISSUES



4 ENVIRONMENTAL ISSUES

4.1 WATER

Water is required for many activities throughout the site:

- Air cooling systems
- Irrigation

This means that a certain amount of water needs to be stored on site. Part of the existing basement will be used for this purpose. Energy derived from the generator will be used for the pumping water in some of the systems. Due to the valuable nature of water the building users will constantly be reminded and questioned about their water using habits.

4.1.1 Rainwater harvesting and use

Average rainfall during each month of the year on total area of site (15 470 m2; half city block):
If water is harvested from the whole city block the following figures equals the sum of water that can be harvested. At R 3,00 per m3, the total amount of money that can be saved per month is added to the table.

January: 2104 m3	R 6312
February: 1160 m3	R 3480
March: 1269 m3	R 3807
April: 789 m3	R 2364
May: 201 m3	R 603
June: 108 m3	R 324
July: 46 m3	R 138
August: 92 m3	R 276
September: 340 m3	R 1020
October: 1089 m3	R 3264
November: 1516 m3	R 4548
December: 1702 m3	R 5106
Total:	R 31 242, 00 per year

Average amount of water harvested per month: 869 m3 / month

WATER USE

Water consumption in building:

Average of 150 people in building (exaggerated figure)
@ 20 litre per person per day
150 x 0,002 m3 = 3 m3 per day
3 x 7 days a week = 21 m3 per week

Water consumption in landscape:

0,6 = factor of planting on site
15470 x 0,6 = 9282 m2 of planted area
@ 0,025 m3 per m2 per week
232,05 m3 water needed per week for irrigation (928,2 m3 per month)
During April to September natural rainfall will not be enough for irrigation, but if indigenous species are used, it will fit the climate more

water system changed (see technical report)

Water harvesting
Rainwater is harvested and stored for use.
Urban park
Rooftops (including Munitoria)
If the maximum amount of water that can be harvested and the monthly need of 1012, 2 m3 water is taken into account, then a deficit at the end of the year is 1729 m3. Now, if calculated that indigenous species will be used predominantly, water requirements in the winter can be halved. This means that at the end of the year a surplus of 407 m3 of water is left over. Water harvesting is therefore a very important factor.
Another source of water is the aquifer that is situated beneath the site.

Water storage tank
A tank to the size of 3000m3 can be placed underneath the complex. Meaning that a reserve of 2 months of water can be stored in the tank. The challenge is to accumulate/harvest 3000m3 of water.

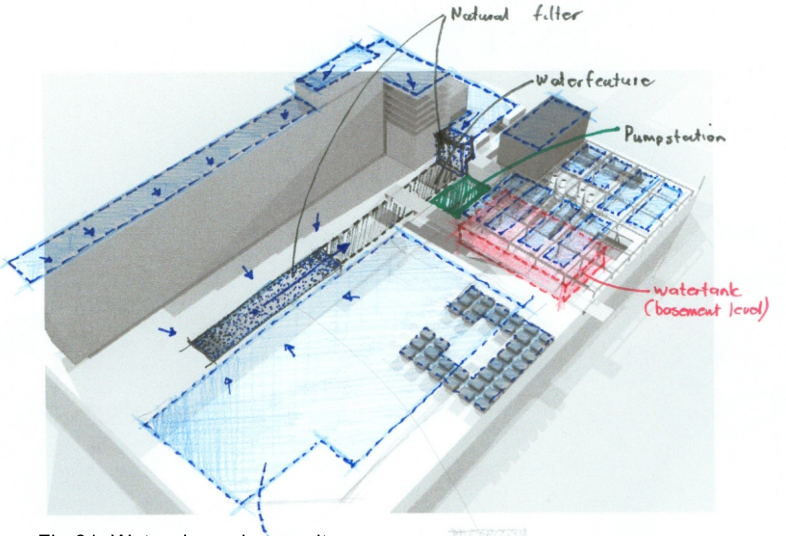


Fig 21: Water dynamics on site

4.1.2 Grey water

Grey water will first undergo a filtration which will rid the water of most damaging substances. The grey water can be incorporated into the outside irrigation system for landscaping and agriculture. When using recycled grey water on the landscape, detergents and cleansers which contain a significant amount of sodium, boron or chlorine because they can be damaging to the health of soil and plants. The long term use of grey water is to gain a degree of dilution, filtering and distribution over the soil. Adding gypsum and compost to grey water affected soil will neutralise the detrimental affects of sodium, ammonia and phosphate salts.
The extensive use of grey water for domestic irrigation will both reduce demand and provide some recharge to groundwater. [Walter, B. Arkin, L. Crenshaw, R. 1992]

4.1.3 Runoff

Runoff on site will be reduced by manipulating and enhancing the existing topographic conditions, to improve the sites ability to catch, hold and absorb water. [Walter, B. Arkin, L. Crenshaw, R. 1992]

4.1.4 Planting

Indigenous species will primarily be used which limits the water requirements.

4.2 ENERGY

4.2.1 Current Problem

Tshwane Metropolitan's electricity is generated by burning coal which creates heat. The heat is used to drive a turbine (through pressure and steam) that generates electricity. The electricity is then fed into a cabled grid that spans large distances until it reaches the user. This process is an inefficient way of consuming our resources.

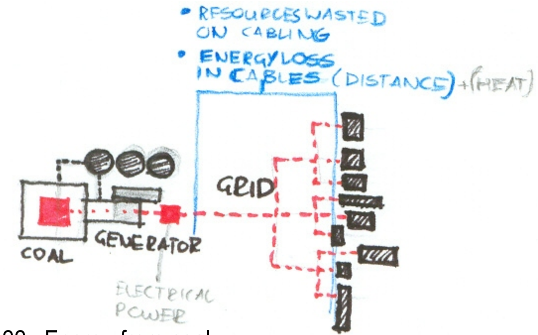


Fig 22: Energy from coal

What we should rather be doing is harvest the last drop of energy from the environment that surrounds the site.

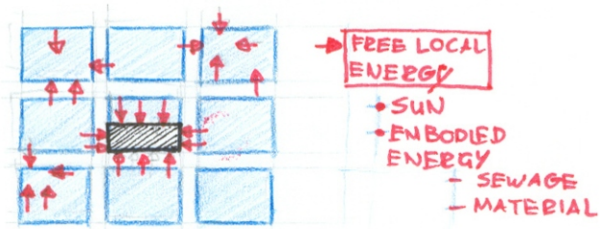


Fig 23: Energy from local environment

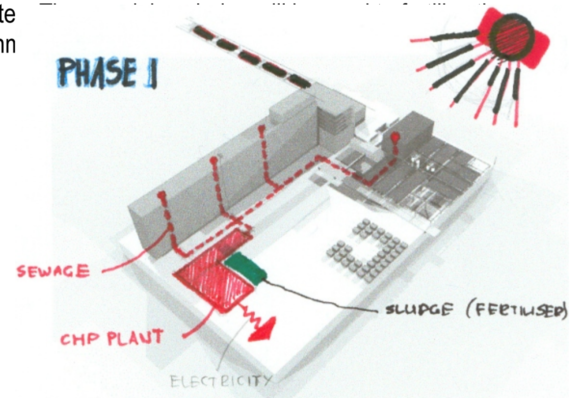
This energy comes in several forms:

Sunlight
Sunlight can be harvested through photovoltaics and passive design techniques
Embodied energy (Urban context)
Sewage and raw material can be used to create electricity and fertiliser for the natural environment.

4.2.2 Energy Systems

Phase 1: Energy from sewage

Sewage can generate energy by a process where organic waste is deposited in a closed and ventilated space. It is then transported to a mixer where solid, hard objects like stones and metal is removed. The incoming waste is then heated and fed to the digestion vessel or biogas reactor. After the anaerobic digestion by microbial action is complete the gas powers a CHP plant generating electricity and heat. The treated sludge can be used as a fertiliser. [Smith, P. 2003]
The sewage will be attained from the Urban Generator and the existing Munitoria building.
To avoid odours in the urban environment all the air will be discharged through a chimney that reaches an acceptable height.
The capital cost of the system will be divided between stakeholders which will be the neighbouring buildings. Each of the stakeholders will receive credit each month depending on the amount of energy the CHP plant generate
park and the surrounding natural environn



Phase 2

Phase 2: Energy from sewage and the sun

This phase can be seen as an evolvement of phase 1.
Photovoltaic Solar panels are added on site.
Sewage from the neighbouring buildings is diverted to the CHP plant. There is of course a maximum amount of sewage which the plant can operate. The rest is released back into the municipal sewage system.

CANCELLED system not used in project due to its unpractical application in South African climate

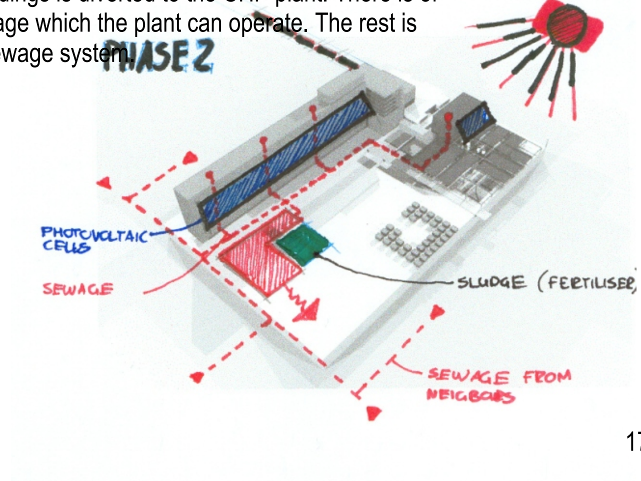


Fig 25: Phase 2

4.2.3 Appliances and fittings
Energy efficient fittings and devices are used throughout the building.

4.3 RECYCLING AND REUSE

4.3.1 Toxic waste
Arrangements will be made for the safe disposal/recycling of toxic harmful substances. [Gibberd, J. 2002.p12]

4.3.2 Inorganic waste
Inorganic waste is collected and sorted. Some of the waste is used to create products that will be sold in the market. The rest will be distributed to a recycling company.

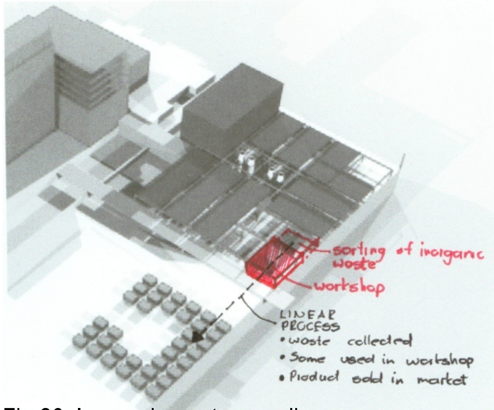


Fig 26: Inorganic waste recycling

4.3.3 Organic waste
Organic waste is collected, composted and used as fertiliser for the park or added as fuel to the CHP plant

4.3.4 Construction waste and processes
Construction waste is minimised by using the existing basement on site. Further management of the construction practices will limit wastage. Modular components of the roof structure and office facade will limit on-site wastage.
Existing vegetation will be retained and the clearing of earth minimised. The existing parking area will be converted into the urban park. The underlying soil will be used and if necessary more fertile soil added.

4.4 SITE
The site has previously been disturbed.
The ecosystems that previously occupied the site contributed to oxygen and carbon dioxide levels and maintained temperatures within a limited range. The Urban Regenerator aims to maintain these levels as well as keeping temperatures within a limited range by including extensive vegetation into the design.

4.4.1 Brownfield site
The development is to be constructed on the basement and ground floor of the burned down west wing of the old Munitoria building.

4.4.2 Neighbouring buildings
The building does not have a harmful effect on the neighbouring buildings; on the contrary the Urban Regenerator's aim is to have a positive effect on all of its surrounding neighbours. It complies with the solar envelope, meaning that neighbouring buildings will still have solar access.

4.4.3 Vegetation
There are various reasons for using so much vegetation on the site:
- Help reduce carbon dioxide levels
- Increase oxygen levels
- Decrease heat island effect
- Create a social and comfortable space
- Help filter the air for ventilation use and overall cleaner city air

Roof gardens will help insulate the building.
The vegetation and landscaping on the site will provide habitats for some animals.

4.4.4 Landscape inputs
Landscaping won't require heavy artificial input of fertiliser and water because of using so much indigenous species as possible, but frequent composting will enable the soil to become a rich asset. The landscaping has to be monitored to ensure that pests won't become a problem.

4.5 MATERIALS AND COMPONENTS

4.5.1 Embodied Energy
Preliminary schedule of main materials used:
(Arranged more or less from high embodied energy to low)
- Constructional steel (structure)
- Reinforced concrete (structure)
- Pre-cast concrete (modular design components, roof structure)
- Sheet metal
- Mass Concrete
- Brick (landscaping and walls)
- Concrete blocks
- Glass (insulation, sound control and solar gain)
- Wood (structural)
- Rock (landscaping and walls)

4.5.2 Material / component sources and recycled material
Part of the existing burned-down structure found on site, will partly be demolished and materials reused.
All materials and resources are found within a 50 km radius of the site.
Support programmes will be initiated in the production of certain materials like bricks and concrete blocks in hope to improve skills transfer in certain industries.

4.5.3 Manufacturing processes
Carbon dioxide and other emissions associated with the manufacturing processes need to be considered and this will help decide which manufacturer to choose.

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