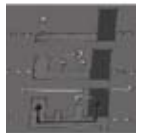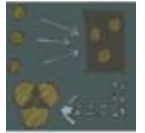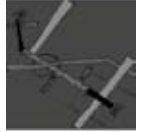# research

In this chapter the connectivity between the sub questions (p.10) will be established and a conclusion will be drawn to determine a possible answer for the problem statement.

4.1.1. WHAT IS SUSTAINABILITY?

According to the author, sustainability means to constantly be aware of the environment around and always striving for better living conditions. Sustainability has three interdependent factors- the one cannot function without the other. The Green Handbook of South Africa gives a clear definition of environmental, social and economical sustainability.

Environmental sustainability_
This requires that natural capital remains intact. This means that the source and sink function of the environment should not be degraded. Therefore, the extraction of renewable resources should not exceed the rate at which they renew, and the absorption capacity to the environment to assimilate wastes should not be exceeded (Van Wyk, 2009: 23).

Social sustainability_
This requires that the cohesion of society and its ability to work towards common goals be maintained. Individual needs, such as those for health and well-being, nutrition, shelter, education and cultural expression should be met (Van Wyk, 2009: 23).

Economic sustainability_
This occurs when developments, which moves toward social and environmental sustainability, is financially feasible (Van Wyk, 2009: 23).

In the last decade or two, environmental awareness has grown exponentially around the world. Global warming is a reality and has been proven by scientists. The question is no longer: if global warming will happen its

is rather: when will we start experiencing its full effects and their consequences. The earth's surface temperature has already increased by about 1.8°C, total snow cover has decreased and sea levels are still rising (Scientists, 2009).

"The evidence is now clear: industrial civilization has caused irreparable damage. Our political and corporate leaders have persistently ignored the overwhelming scientific evidence. It's not just the 11th hour its 11:59. By the end of the century there might be 150 million environmental refugees. There are too many of us, using too many resources too fast. Every living system on earth is in decline and the rate of decline is accelerating. The tragedy is the extinction of human kind. Our prevailing generation has to create a sustainable world
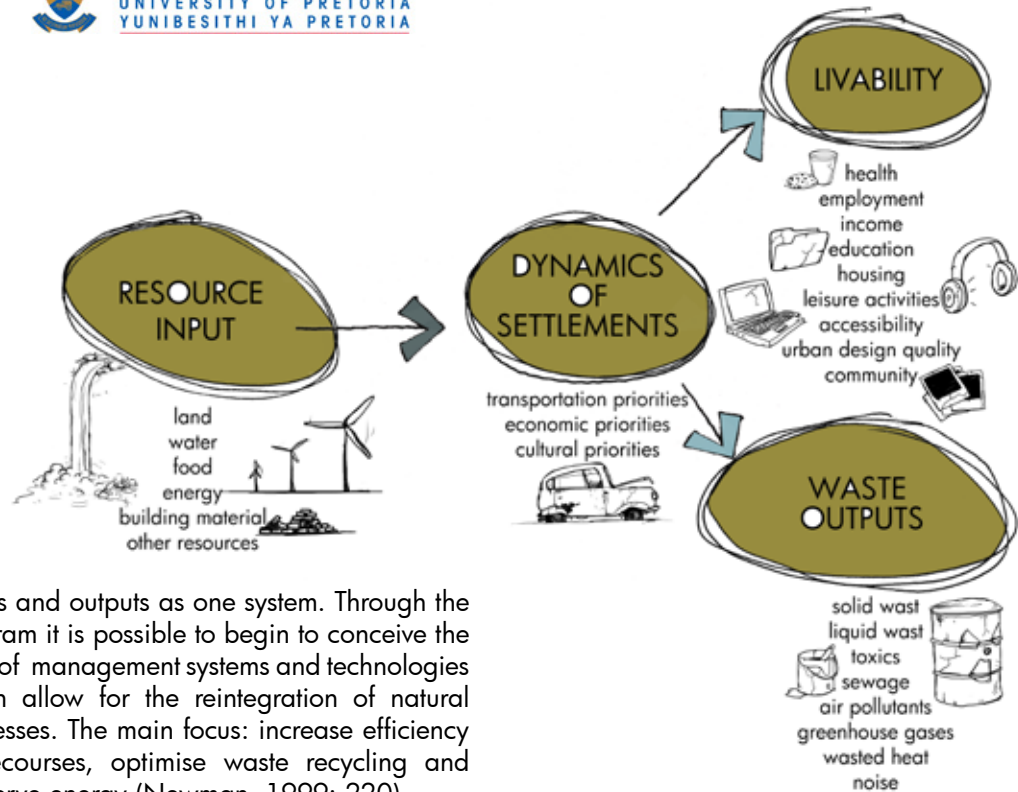
fig. 47_ Peter Newman's diagram illustrating pathways of input and output systems (Newman, 1999: 220)

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the question is, will we be able to do this in time. People need to realize that there are things they can change in their everyday lives. With existing technologies we can reduce the human footprint on earth by 90%. Redesign design itself. It needs to be our priority. Today's generation gets to change the world!"

(The 11th Hour: Turn Mankind's darkest hour into it's finest, 2008)

To understand the sustainable concept more clearly, the city needs to be viewed as a ecosystem. With inputs of energy and material, environmental problems are related to the growth of these inputs and managing the increased outputs. Peter Newman, professor of city policy in Australia, draws a diagram (fig.45) to understand the pathways of these inputs and outputs as one system. Through the diagram it is possible to begin to conceive the idea of management systems and technologies which allow for the reintegration of natural processes. The main focus: increase efficiency of recourses, optimise waste recycling and conserve energy (Newman, 1999: 220).

4.1.2. WHAT IS A SUSTAINABLE INDUSTRIAL CULTURE?

Approximately 230 years ago industrial urbanisation began on a global scale (Byrne, 2002: 261) and industrial systems were more than just economic production. Distinctive cultural forms, shaped around this through social production and reproduction. Today, because of deindustrialisation, industrial cultures are seen in a negative light, as working against innovation and modernization. This is problematic, because industrial cultures are so much more than just production: it is a component of identity. When production in a area fades away, large communities with multi-generational experience of industrial life, stay behind. *"The history of industrial society is a history in which masses, as well as elites, believed that they could change things to be as they would wish." (Byrne, 2002: 280).*

Sustainable industrial culture acknowledges that projects are process-orientated, but it must also aim at facilitating cultural sustainability. One must first understand what cultural sustainability means, for the people involved, before change can take place. The overall aim is to create a new sense of place, with a heightened awareness between humans and nature. Sustainability is not a fixed state of affairs, it is a continues process which involves positive and healthy self-development.

"Cultural vitality and viability is as necessary for sustainable development as social equity, economic viability and environmental responsibility" (Birkeland, 2008: 283).

The new sustainable industrial culture also calls for the assessment of products that will be manufactured in the future. The life cycle of a product needs to be determined before the it manufactured: all input and output levels must be calculated beforehand. This method assesses and evaluates the environmental, occupational health and resource impact of a product (Alting & Jorgensen, 1993: 167). Products can thus only be economically sustainable if it meets the needs of the social and environmental factors.

Social sustainability is as important as environmental and economical sustainability. The industrial culture in Pretoria West is already more than 100 years old, people live in and around the area even though the conditions

are not ideal. There is very little green or public space and the buildings do not really interact with the street. South Africa needs industry to survive and the industry is as much a part of an integrated city as housing and retail. The focus should therefore be turned toward social sustainability. It is only then that perceptions might change and Pretoria West can develop a sustainable industrial culture.

fig. 48_ Mitchell Street, very few people are seen in the public areas, there are few public open space amenities and streets do not interact with private land but are rather fenced off

4.2.1. ADAPTATION AND REUSE OF HERITAGE INDUSTRIAL BUILDINGS

As one of the world's first industrial nations, Britain presently has several initiatives promoting an integrated form of theory and practice on urban planning, architecture and the development of heritage industrial buildings and areas.

The late Michael Stratton (2000) was part of a team at the Institute of Advanced Architectural Studies at the University of York. He visited numerous redundant industrial buildings of architectural and historical value all over Britain and abroad. He focused most of his energy on the adaptation of old industrial buildings for contemporary, economic, residential and cultural uses. He did not suggest building a better yesterday, but to encourage and welcome appropriate new additions and adaptation to the heritage of industrial buildings.

Stratton, together with HRH Prince of Wales, established The Prince's Regeneration Trust (Trust, 2010) in 1997, a charity organisation that supports the regeneration of economically or socially disadvantaged areas, through the conservation and reuse of redundant historic buildings. The Trust is committed to sustainable development, implementing practices which promote vibrant and inclusive communities, a productive and innovative economy and a, healthy, flourishing natural environment. They first focus on areas of economic and social need. Then they encourage the preservation and development of valuable skills in traditional building craft and strive to honour the individuality and historic character of the their countryside, towns and cities.

Coal Fired Power Stations in South Africa
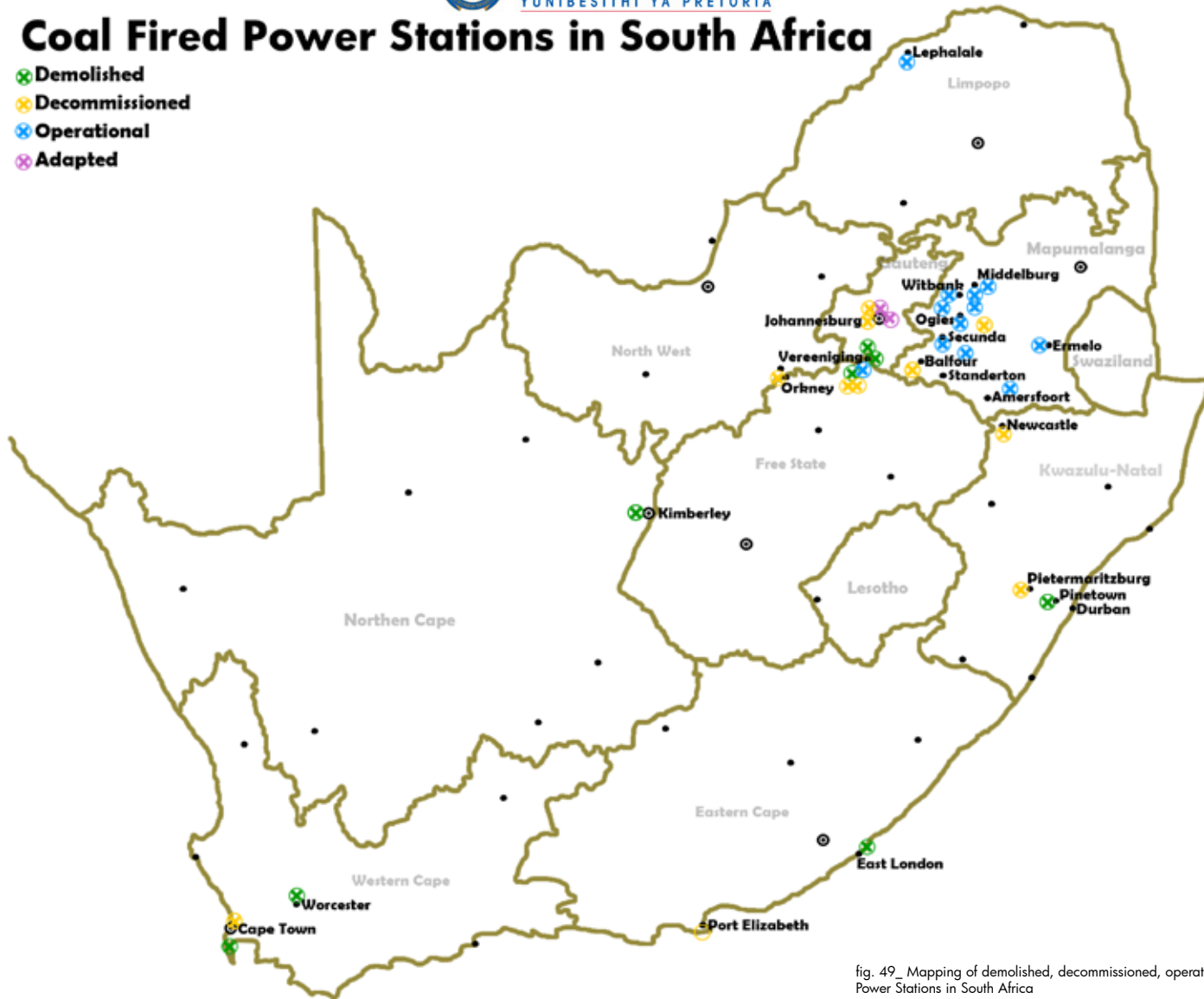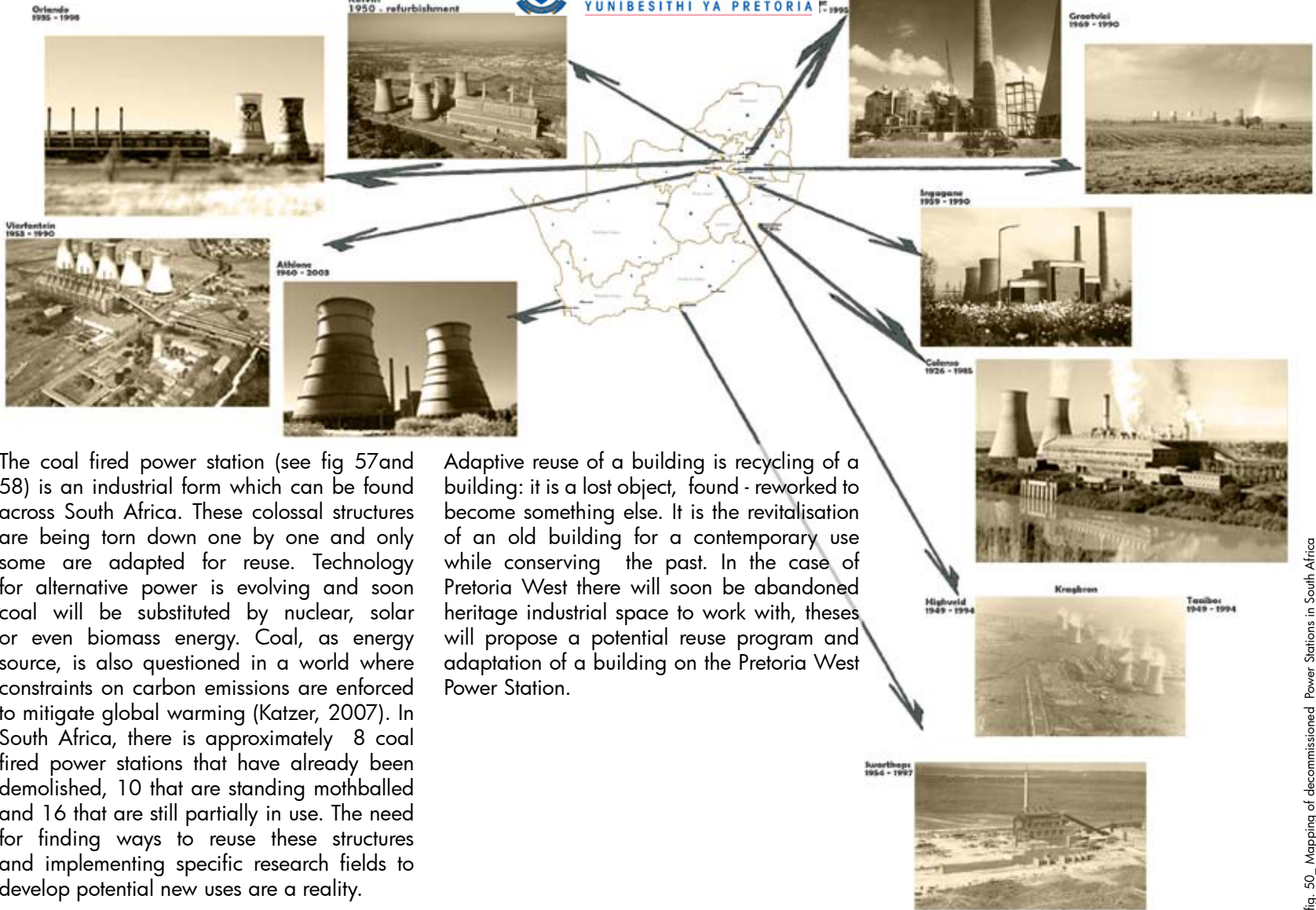
⊗ Demolished
⊗ Decommissioned
⊗ Operational
⊗ Adapted

fig. 49_ Mapping of demolished, decommissioned, operational and adapted
Power Stations in South Africa

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Orlando
1935 - 1998

Kelvin
1950 - refurbishment

Grootvlei
1969 - 1990

Vierfontein
1953 - 1990

Athlone
1960 - 2003

Ingagane
1959 - 1990

Colenso
1926 - 1985

Highveld
1949 - 1994

Kraghran

Taaibos
1949 - 1994

Swartkops
1954 - 1997

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The coal fired power station (see fig 57and 58) is an industrial form which can be found across South Africa. These colossal structures are being torn down one by one and only some are adapted for reuse. Technology for alternative power is evolving and soon coal will be substituted by nuclear, solar or even biomass energy. Coal, as energy source, is also questioned in a world where constraints on carbon emissions are enforced to mitigate global warming (Katzer, 2007). In South Africa, there is approximately 8 coal fired power stations that have already been demolished, 10 that are standing mothballed and 16 that are still partially in use. The need for finding ways to reuse these structures and implementing specific research fields to develop potential new uses are a reality.

Adaptive reuse of a building is recycling of a building: it is a lost object, found - reworked to become something else. It is the revitalisation of an old building for a contemporary use while conserving the past. In the case of Pretoria West there will soon be abandoned heritage industrial space to work with, theses will propose a potential reuse program and adaptation of a building on the Pretoria West Power Station.

fig. 50_ Mapping of decommissioned Power Stations in South Africa

fig. 51_ Diagram illustrating the proximity between workshop space, green space, natural light and public interaction: author ,2010

4.2.2. INDUSTRIAL ADAPTATION AND A SUSTAINABLE INDUSTRIAL CULTURE

The adaptive reuse of existing buildings supports sustainability, as well as the smart growth initiative. Smart growth is an anti-sprawl proposal that invests time in restoring communities and vitality in abandoned or redundant parts of cities. It also promotes public transport and pedestrian orientated cities (Technology, 2010). Industrial buildings are known for their large open spaces, they are thus well suited for adaptive reuse. Industrial buildings can be adapted for reuse, to support a sustainable industrial culture. This culture depends on the preplanning of products and the effect it would have on the people using the facilities and its environment.

Through analysis it is evident that the industrial realm need to focus more on social sustainability. This factor of sustainability is severely neglected. When a heritage building is adapted or reused, one's main goal should be to produce a building that supports a sustainable industrial culture. A structure that nurtures people's health and well-being, not only managing waste and toxins to create a hazard free environment, but also a healthy environment with social stability, natural light and fresh air.

The design focuses on the environment inside the building to produce workshops with ample natural light. The spaces will be connected to nature with green courtyards that open-up into the space. This will also give workers the opportunity to sit outside whi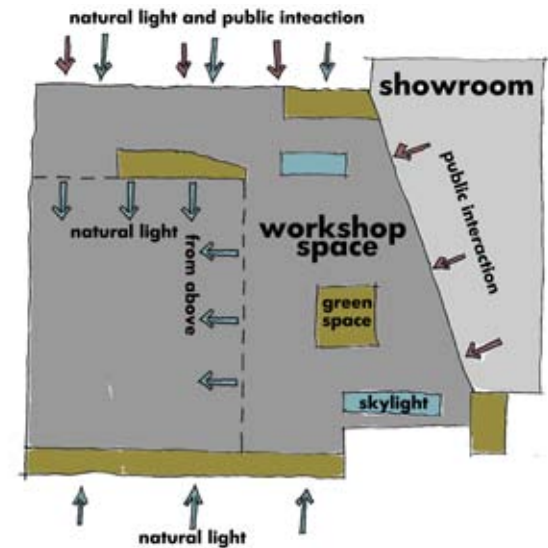le working. The production process will be revealed to form a connection between industry and passer by. Showroom space will be connected to workshop space, with glazing, to educate buyers about the production process. The social connectivity between the public and the worker will occur through views.

4.3. Social responsiveness: people, activities and the environment_

According to Jan Gehl , architect and professor of Urban Design at the Royal Danish Academy of Fine Arts in Copenhagen. All outdoor activities can be divided into three categories: necessary, optional and social activities (Gehl, 2006: 9). Necessary activities are obviously compulsory activities: going to work, school, the super market, etc. Optional activities are the activities people would like to do: go for a walk or a breath of fresh air. Optional activities usually only take place when the weather is favorable. These two activities are directly linked: when outdoor quality is bad, people tend to only do necessary activities. When the area is of high quality, optional activities start to emerge in-between necessary activities. Thirdly, social activities depend on necessary and optional activities, these

activities depend on the presence of people in public spaces: children playing, communal gatherings, greetings and conversation. It is primarily dependent on passive contacts such as hearing and seeing other people. Social activity is a spontaneous activity. It is a direct consequence of people moving in the same space, it can also be understood as something that takes place every time two people use the same space (Gehl, 2006:16).

These three activities are not necessarily dependent on physical architecture, but rather on the spaces designed in-between buildings: spaces where people meet and see each other. Social responsiveness, in this document, refers to the ability of people to see and hear others and to experience other people functioning in

various situations. It is a source of inspiration, stimulating the senses through experience.

Team Zoo argues in their design principles that responsive environments are places which interact with people by stimulating the senses. It is creating a space where people can move through and around to communicate and exchange ideas. Their common concern is the relation between nature, humans and the cultural features of a place and the human response to them (Jencks & Kropf, 1997). They design to inspire emotional response. It is thus clear that social responsive environments rely on specific activities, that bring people to interact with each other through seeing and hearing. It does not necessarily rely on architecture, but rather on the spaces between

and next to buildings. If public spaces around industrial buildings (squares, streets, etc) are designed to heighten the social interaction between people, a more social responsive environment can be established.

The Pretoria West Power Station is a grand opportunity for industrial redevelopment. The Pretoria West framework group proposes a development with mixed use functions. The group envisions a light, industrial precinct where different people can interact on a daily bases. Necessary and optional activities will commence in this area because it is the placement these functions that will ultimately determine if social activities will occur.
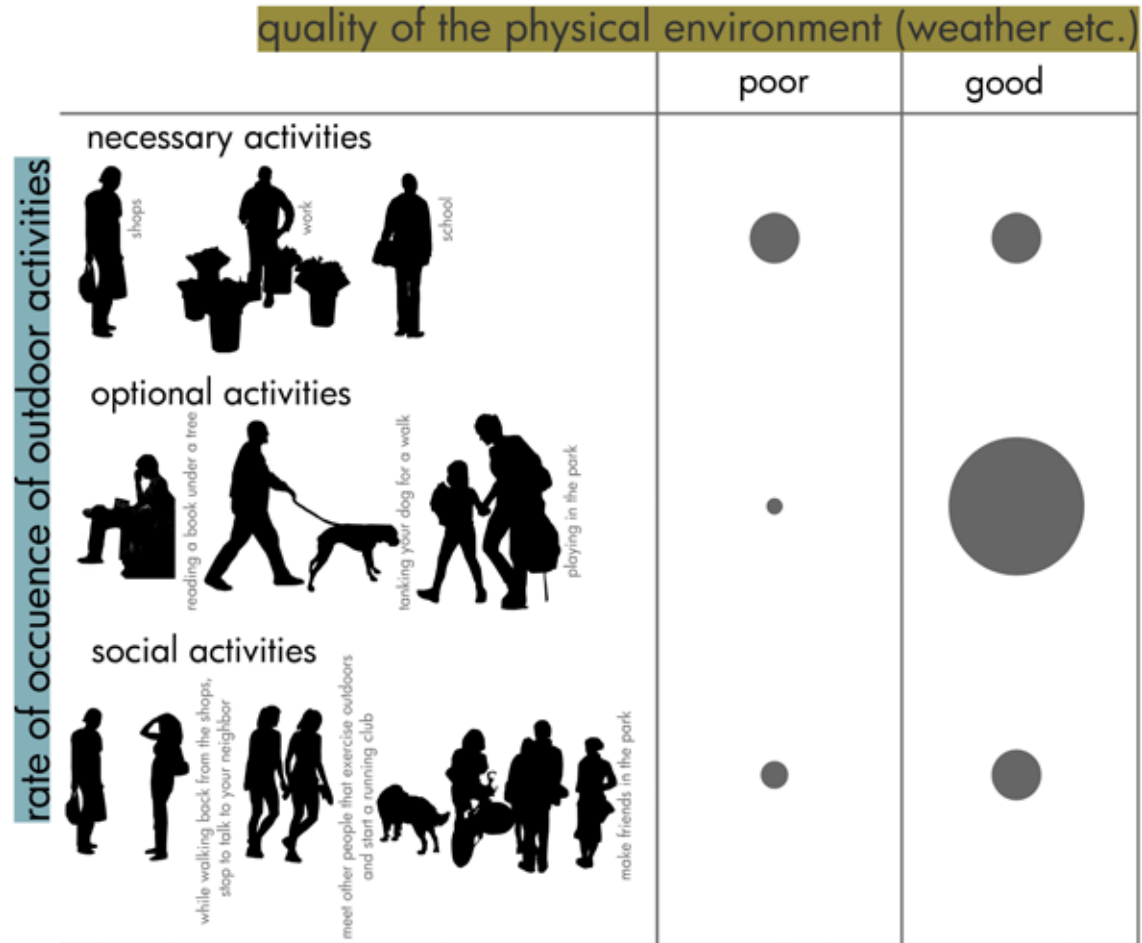

fig. 52_ Grapic representation of the relationship between the quality of outdoor space and the rate of occurrence of outdoor activities: author, 2010

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fig. 53_ Architecture can establish a connection between production and daily life: author, 2010

4.4. Social responsiveness, our local economy and skills development_

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The background study (p.9) revealed that South Africas' local economy and skills development need some sort of motivational injection. If skills development is endorsed local economy will flourish.

In the United States, researchers found that not enough engineers are being trained. The reason for this is that people are not interested by the manufacturing process anymore. Apparently the shortage may have something to do with perception: Engineering and manufacturing is not considered a glamorous profession like law or medicine. In this regard the US established the Bright Mind initiative to get young people interested in manufacturing. They give students a full day program that introduces them to prototyping, tooling and

additive manufacturing industries; the idea is to open their minds to possible alternative career choices (Engineers, 2010).

This example shows us the value of exposure. Industrial buildings are usually closed off to the public, one only sees raw material entering a factory and a product that exits. The process/story of the product is hidden from the passer-by and the author is of opinion that, if the production process was to be revealed, people would be able to identify with the building on a day to day basis. More people will start to understand manufacturing processes and this might lead to the initiation of skills development.

4.5. Production and daily life_

"It is not the formal integration of buildings and primary city functions but the actual integration of various events and people on a very small scale that determines whether the contact surface is monotonous or interesting. What is important is not whether factories, residences, service functions, and so on are placed close together on the architects drawing, but whether the people that work and live in the different buildings use the same public space and meet in connection with daily activities."

(Gehl, 2006:101)

Social activities will only occure after necessary and optional activities are in place. According to the Compaction and Densification Strategy of Tshwane (2005), Pretoria is a functionalist city. This revers to an evident segregation of functions and groups that differ from each other i.e. industrial, residential, governmental. Working, playing and living components are scattered over the whole of Tshwane and a large number of people are trapped in their circumstances, because employment is too far from where they can afford to live.

Gehl's theory on integration articulate the importance of various activities and functions in and around public spaces. These allow people in the area to function together, to stimulate and encourage one another.

Industrial buildings are closed off to the public because, like in Pretoria West, there are few public spaces and the street are designed for cars. These buildings have so many functions and activities within them and the interaction between man and machine. Responsive environments not only facilitate social activity, but also support experience through stimulation of the senses. By revealing manufacturing processes to the public, they will see and learn how things are made. Most importantly public spaces should be used to join the production process with other programmes like housing, night life and retail.

"Only a very small group of the most annoying industrial activities is unsuitable for integration with residences" (Gehl, 2006:102).

If social activities are activated and the integration of functions in areas are supported. Architecture can establish a visual and sometimes physical connection between production and daily life

Findings and intentions that will be taken forward in the design:

Social sustainability:	Internal workshop environments will be designed to nurture the workers health and well-being, ample natural light and fresh air will infiltrate spaces. Green spaces will be designed parallel to the production cycle and furniture makers will have the option of working outside when the weather is favourable.
Evironmental sustainablility:	Brownfield site, using existing infrastructure, natural ventilation, sustainable heating and cooling systems, water harvesting, natural light and solar water heating.
Social activities:	There will be a direct connection between furniture maker and the general public. The vision for the Pretoria West Power Station is a mixed use light industrial precinct. Housing, retail and educational facilities will be in close proximity to one another. More than half of the power station site will be preserved as a public nature reserve to provide the city with recreational green space. The study area will therefore provide facilities that accommodate necessary and optional activities, spaces between buildings will be designed to strengthen social activity.
Industrial culture and social responsiveness:	The study showed the value of industrial exposure and that industrial buildings should reveal their processes, evidently creating a building that people can identify with. There will be a direct connection between furniture maker and the general public. Urban fabric with high intensity pedestrian movement will move past the building, the proposed intervention will interact accordingly. Large glass walls will leave spaces transparent and a visual connection can accumulate.
Adaptation and conservation:	A contrasting structure will connect with the 1940 Boiler House to accentuate the historical quality of the site. The form and proportions of the proposed furniture showroom will be informed by the existing surrounding structures.

fig. 54_ At the end of the day it's making space for the user of the building, evidently those are the people that would determine the success of the it: author, 2010