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In the late eighteenth century Industrial cities came to life after the development of Industrial Capitalism. The historical city that evolved around agricultural produce and a site's defensibility changed to a city focussed on production and capital accumulation. A substantial substitution of market for administrative or political location choices may perhaps be the most important difference between urban development before and after industrialization (Meyer, 2000:7). The industrial city is an urban form that evolved very quickly from the late eighteenth to the early twentieth century and just as quickly grew obsolete (Widner, 1986: 47). In this process of being obsolete it became discarded from the rest of the urban fabric, with very little or no connection, resulting in a defragmented urban fabric and urban decay.

The street plan of the Pretoria study area; Pretoria West (fig: 3) was laid out in 1892 as an extension of Pretoria Central. It was the first urban extension to the west of the city followed shortly after Arcadia, Sunnyside and Muckleneuk. Although conceived as a compensation measure for Boere Burghers, it was also indicative of the expansion and relative

wealth of Pretoria during the 1890's, following the development of gold mining on the Witwatersrand. By 1910 the area was largely developed with single-storey middle class and workers' houses. The development of the iron industry in the 1930s resulted in major factories being developed along Mitchell Street (PWIF, 2004). Today Mitchell Street is an industrial cluster that is predominantly car-related (fig: 4), mixed with the occasional concentration of commercial activities. The Pretoria West Power Station (fig: 3) and steel producer ArcelorMittal (previously known as ISCOR) are also located in the study area and are currently severely under-utilised and offering immense potential for urban regeneration. The termination of the Pretoria West Power Station in the near future, and closing-down of ArcelorMittal are considered advantageous as it, to a certain extent creates opportunities for various other types of new developments that will contribute to the diversity and densification of the area. This presents a unique opportunity for the regeneration of the area (PWIF, 2004).

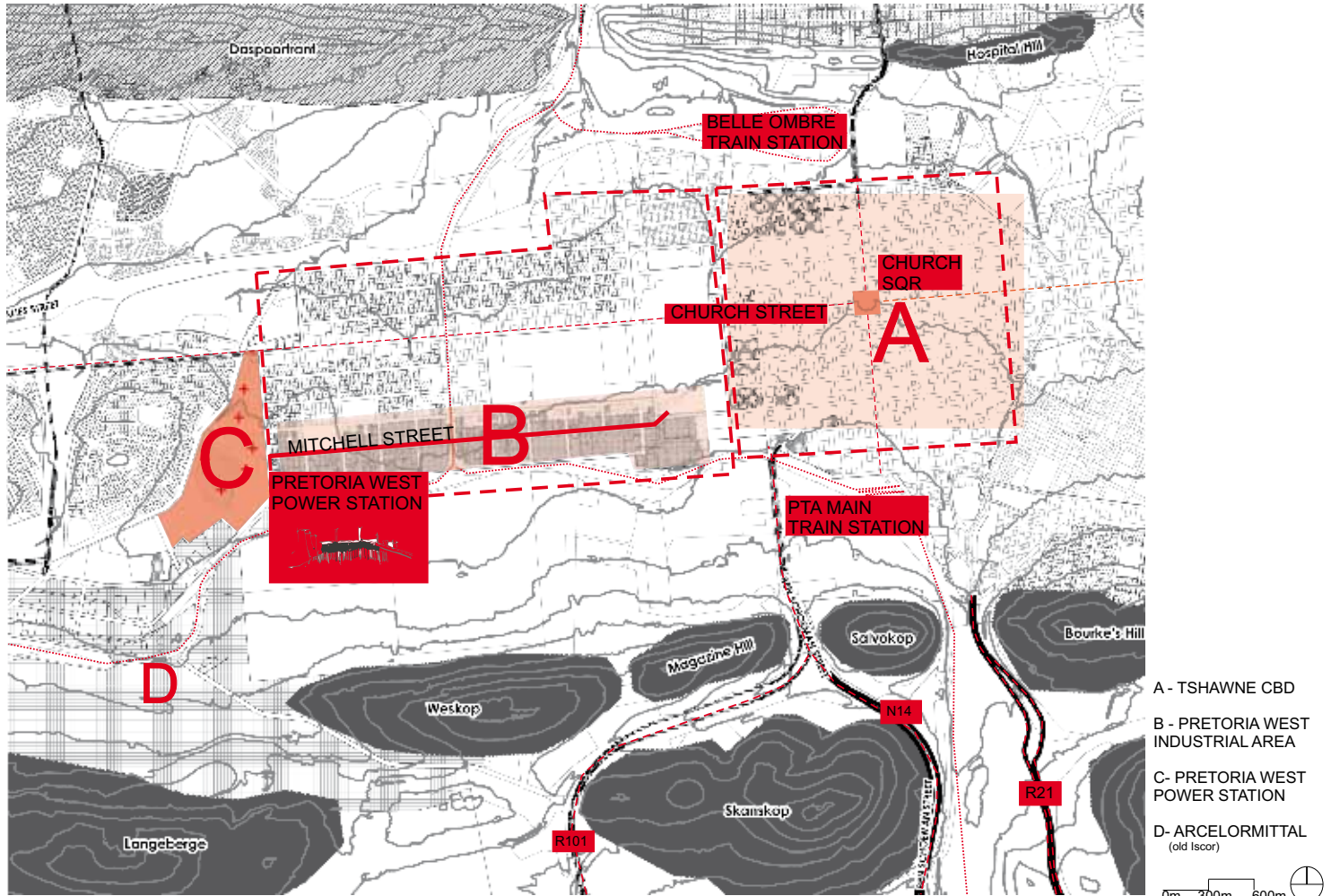


Figure 3. Pretoria West Industrial Area in context with the City of Tshwane CBD. From: City of Tshwane Municipality, edited by Author 2010.

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Vehicle dealers: Mitchell Street



Vacant Commercial building : Mitchell Street



Panel Beater: Mitchell Street

Figure 4. Photo collage of existing urban fabric in Pretoria West Industrial area (Mitchelle Street) showing the deterioration of the area due to the homogenous vehicle related industrial activities: Author 2010.

PRETORIA WEST
POWER STATION

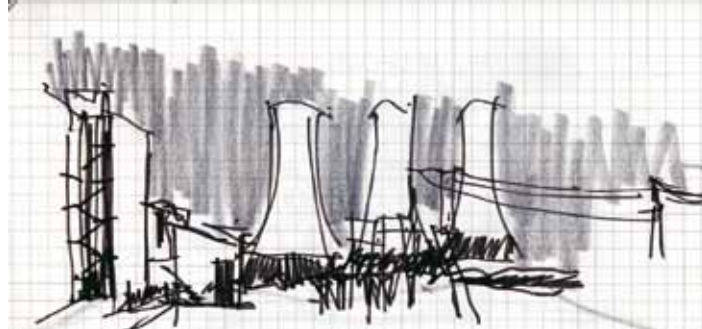


Figure 6. Sketch by author to capture the atmospheric and iconic qualities of the Pretoria West Power Station.



Figure 5. Pretoria West Power Station showing the landmark qualities of the site: Author 2010.



Figure 7. The natural and industrial landscape of the Pretoria West Power Station site: Author 2010.

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Urban regeneration is a process whereby an area is rehabilitated or improved through the creation of a sustainable ecology between economic and ecological networks. The ongoing processes of adaption and change presuppose both development and decline – with the former often dependent on the latter happening before reinvestment and renewal can occur (Carmona, 2003: 258). From a development perspective there is very little vacant land available in the Pretoria West Industrial area which implies that future development in this area will focus on brownfields developments and urban regeneration (PWIF, 2004).

Jane Jacobs (1961: 255) argues that urban regeneration is based on diversity and that city districts will be economic and social congenial places for diversity to generate itself and improve its potential. If the districts possess good mixtures of primary uses, frequented streets, a close-grained mingling of different ages in their building and a high concentration of people. Urban regeneration means various things to different people; for the municipal worker it is the more effective execution of services, for the single mother it is the prospect of a safer environment for her children to grow up in, to the developer it is an opportunity for economic gain, and for the city it is the adaptive re-use of discarded space that will contribute to the reintegration of the city as a whole.

The city of Tshwane, to an extent, has been built up with layers of interdependent urban-cells¹ that feed upon and support one another. The industrial area of Pretoria West could be considered as a discarded urban-cell because of its industrial functions that are becoming obsolete. Historically, this area was a residential suburb (1892), but over the years the character of the area has changed to mono-functional industrial developments (predominantly car related), businesses, flats and single residential areas that became neglected and isolated from the rest of the surrounding urban fabric.

...individual cells have no fixed identity until they are in relationship. This gives the quantum system maximum flexibility to define itself as it goes along. It co-creates with its environment. All of nature's complex systems are at their most creative when they are delicately poised between fixedness and unfixeness - poised at the edge of chaos (Zohar, 1997: 50).

The tradition of equating furniture and buildings with living beings can be traced back to the Roman author Vitruvius, who paired each of the three principal classical orders with a human or divine archetype from Greek mythology (de Botton, 2007: 87). Similarly the city could be defined as a living organism composed of urban-cells, either planned or ones that have spontaneously evolved.

Each urban-cell has its own character and function and the interactions between these cells form a matrix of dynamic relationships in the urban fabric.

The discarded industrial urban-cell of Pretoria West (fig: 8) holds the potential to be reintegrated (fig: 9) into the urban fabric through a process of functional redefinition. The Pretoria West urban-cell, through a process of careful intervention, could once again connect and support the central business district of the City of Tshwane, re-establish its importance within the greater urban fabric and as such become a model for sustainable urban growth in South Africa.

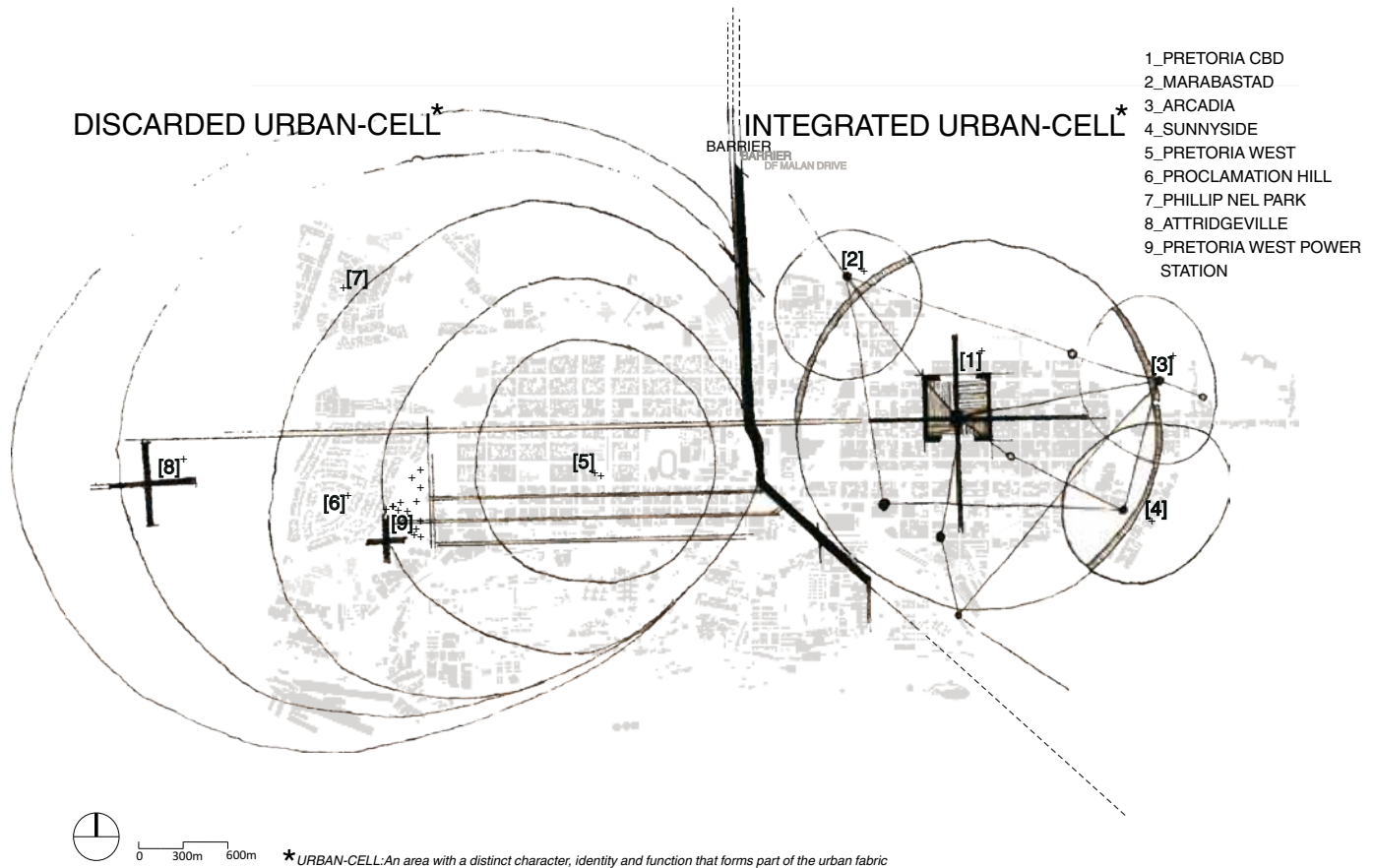


Figure 8. Abstract representation of the discarded Pretoria West Industrial Area in context to the City of Tshwane. The discarded Pretoria West Industrial urban-cell holds the potential to be reintegrated into the urban fabric; to become a sub-support to the City of Tshwane CBD. From: Author 2010.

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INTEGRATED _ URBAN-CELL _sub support to CBD

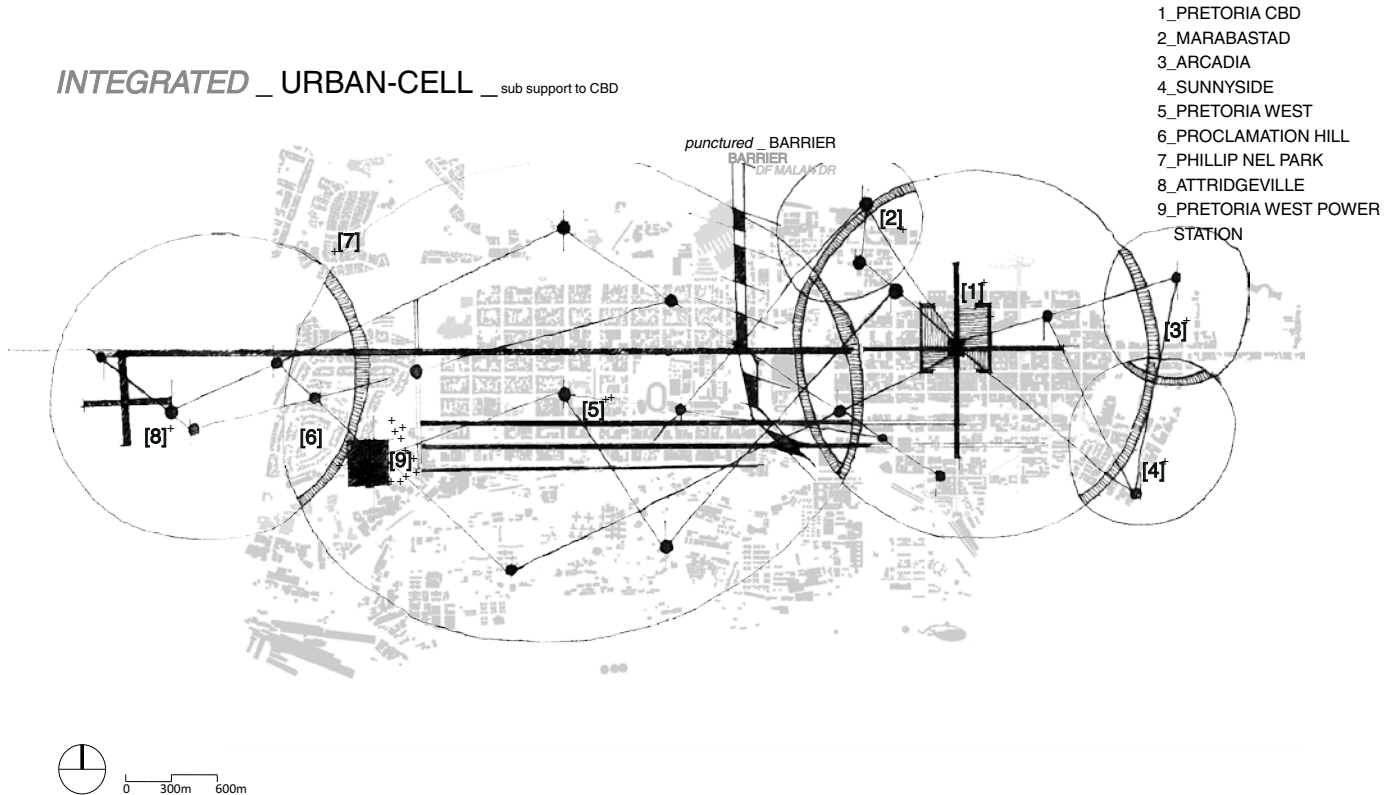
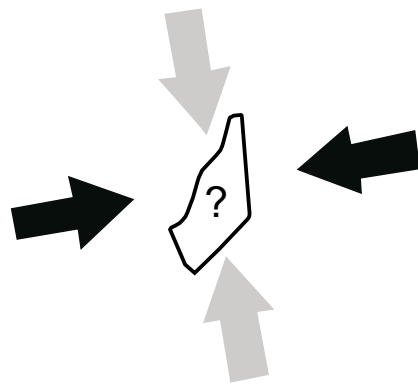
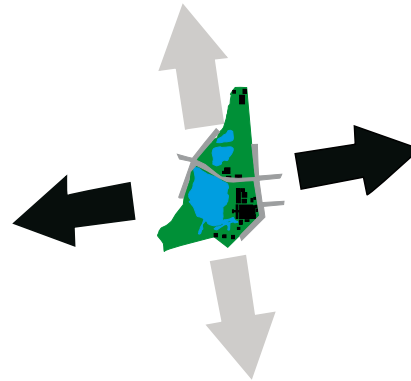


Figure 9. Abstract representation of connections between the Pretoria West Industrial Area and the City of Tshwane. The aim is to establish supporting connections between the various urban-cells to yield an integrated urban environment and stronger supporting structure to the CBD. The Pretoria West urban-cell could once again connect to and support the CBD of the City of Tshwane and re-establish its importance within the greater urban fabric. From: Author 2010.



Pretoria West Power Station _ an enclosed [discarded] industrial area.



Pretoria West Power Station_ intervention node for urban regeneration.



Pretoria West Power Station_ intervention node to connect with adjacent urban fabric.

Figure 10. The Pretoria West Power Station is chosen as the intervention node for urban regeneration in the Pretoria West Industrial Area. The site is a discarded industrial landmark and holds the potential for a diverse and versatile adaptive re-use interpretation, in working with the scale, location and industrial ethos of the site. From: Author 2010.

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Problem statement

How can architecture facilitate the adaptive re-use of a discarded space to enable urban regeneration that will contribute to sustainable urban growth?

Hypothesis

Adaptive re-use of discarded spaces are inspired by emergent/reconnecting functions and relationships that are process- and not product- orientated. When considered and applied to architecture it can foster urban regeneration and improve the sustainability of urban development.

Sub problems:

1. What is discarded space? How is it formed? Why is Pretoria West Industrial area discarded?
2. What is adaptive re-use?
3. What are emergent functions?
4. How can emergent functions be applied to architecture?
5. What emergent functions and relationships exist in the Pretoria West Industrial Area?
6. How do these emergent functions relate to sustainability and urban regeneration to the Pretoria West Industrial area?

Aim of study

The aim of this study is to investigate the role of architecture in facilitating emergent functions through adaptive re-use in discarded spaces (fig: 10) that will promote low energy architecture, energy production and social integration.

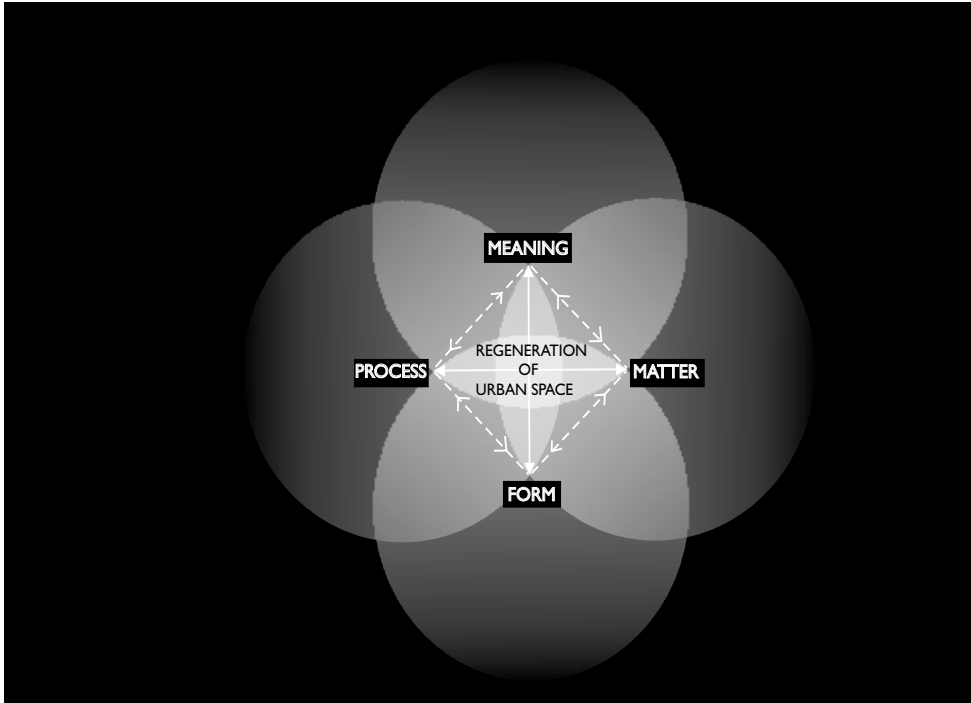


Figure 11. Conceptual understanding of methodology: Author 2010 (visual interpretation).



Figure 12. Hamdi's (2004) backward approach to design: Author 2010.

Methodology

The two approaches that I will use in my methodology include Capra's (2002) framework on the perspective of life (fig:11) and Nabeel Hamdi's (2004) backwards approach to design (fig: 12).

Perspectives on matter: interdependence, relationships and the role of context

Capra's (2002) framework adopts a systemic approach to the critical issues of our time. In terms of the analysis in this study the critical issue is the regeneration of discarded industrial spaces through emergent functions. The analysis focuses on four interconnected perspectives: form, matter, process and meaning, making it possible to apply a unified understanding of life to phenomena in the realm of matter, as well as phenomena in the realm of meaning (Capra, 2002: 261).

In an urban context, a phenomena is understood as emergence and is explained by Nabeel Hamdi's backward approach to design. Wigley (1995) defines matter and meaning as the material and immaterial. His argument is that the material and the immaterial are inseparable components and that the one is not superior to the other.

Western discourse depends on the binary opposition of terms – one superior, the other inferior – that are assumed to be

separate and distinct, such as immaterial philosophy and material architecture. But such terms are in fact interdependent and inseparable, undermining dualistic discourse. Architecture is built into philosophy and material architecture, whether in spatial metaphors such as interior and exterior or in references to philosophical discourse as a sound edifice built on solid foundations (Wigley, 1995: 14).

Hill (2006: 74) refers to material as architectural objects, spaces and users and the immaterial as the relationships between them.

- Form: this refers to the current and historical networks that define the context.
- Meaning: Capra (2002: 84) argues that one will only understand the meaning of anything if one can relate it to other things in its environment, in its past, or in its future, therefore meaning always relates to context.
- Matter: this refers to physical components.
- Process: this refers to a response to physical components.

Backward approach to design

The second approach that will be applied

in the methodology is Nabeel Hamdi's (2004: 130) backwards approach to design i.e. working to plan/analysis/survey in progressive cycles. The aim is not to determine the components for example in housing (type, affordability or even style, according to some housing department). But rather what does a house equals? The opportunities are immense both in terms of process and product and are more qualitative such as wellbeing, dignity, self-respect, security, skills, privacy and so forth. Hamdi explains his design process through examples of different interventions where the emergent intervention is simple and site-specific. Emergence results in the creation of novelty and is often qualitatively different from the phenomena out of which it emerged. This can readily be illustrated with a well-known chemistry example: when the structure and properties of sugar; including carbon, oxygen and hydrogen atoms, bond in a certain way to form sugar, the resulting compound has a sweet taste. The sweetness resides neither in the carbon, nor in the oxygen, nor in the hydrogen, it resides in the pattern that emerges from the interaction (Capra, 2002: 71). When we apply this concept to urban regeneration; the focus should not be on the various components (housing, commercial areas, green spaces etc.) that are needed to regenerate an area, but on the pattern or process of implementation. The pattern or process will determine the components that are needed in the next phase and allows for much more emergence and novelty.

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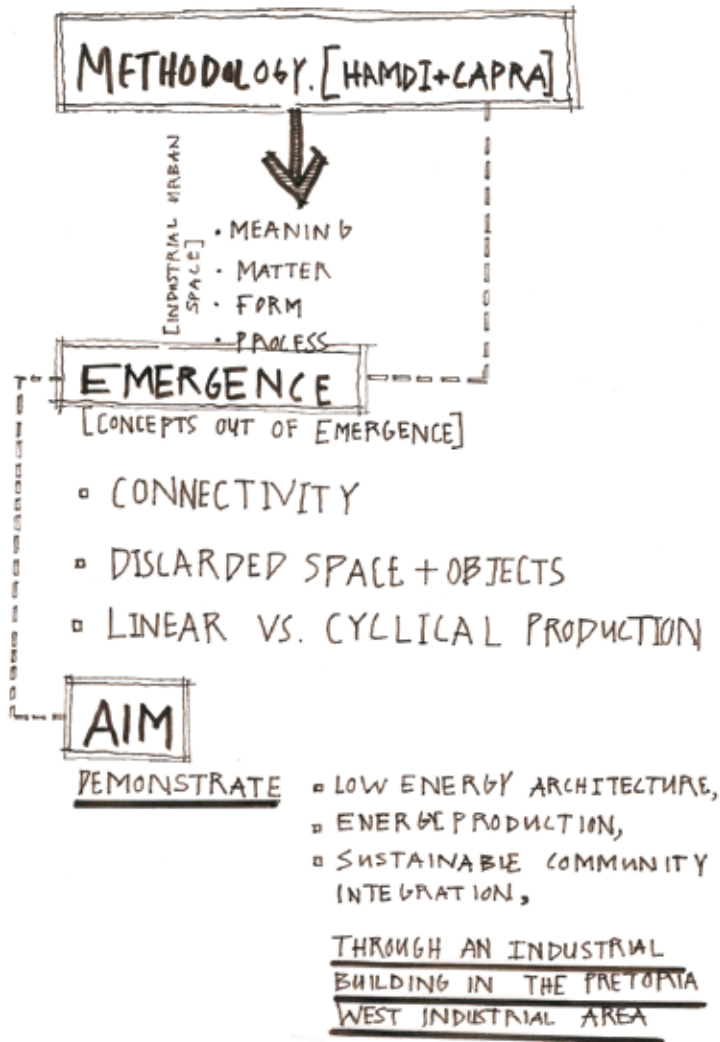


Figure 13. Design process that is guided by the methodology. From: Author 2010.

The design process evolved from a theoretical basis; where the methodology started defined the concepts and aims of the study. The following thinking pattern was employed (fig: 13):

Regeneration of discarded industrial space:

In the applied methodology Capra and Hamdi consider the regeneration of urban space to have four components:

- meaning
- matter
- form
- process

Through a process of emergence these components will contribute to the regeneration of the discarded Pretoria West Industrial Area.

Emergence can be considered as self-organised and holistic thinking. Emergent structures provide novelty, creativity and flexibility, where as design structures provide stability. The issue is not one of discarding design structures in favour of emergent ones. We need both.

EMERGENCE CAN THUS BE DEFINED AS THE INTEGRATED URBAN FABRIC THAT WILL SUSTAIN THE GROWTH AND EVOLUTION OF A COMMUNITY.

Definition of production in terms of emergence:

- Production that emphasizes the community over the individual
- Production that moves away from the concept of being a linear process that is only focused on the product, to that of a cyclical process that respects the material and immaterial components. It is through the interaction of the material and immaterial that emerging opportunities will arise.
- Production that works with existing energy.
- production that establishes emerging opportunities through connectivity between the production process and the local urban fabric.

Concepts flowing out of emergence:

- Connectivity /movement.
- Discarded objects and space (existing energy and activities).
- Production that moves away from a linear process to a cyclical process.

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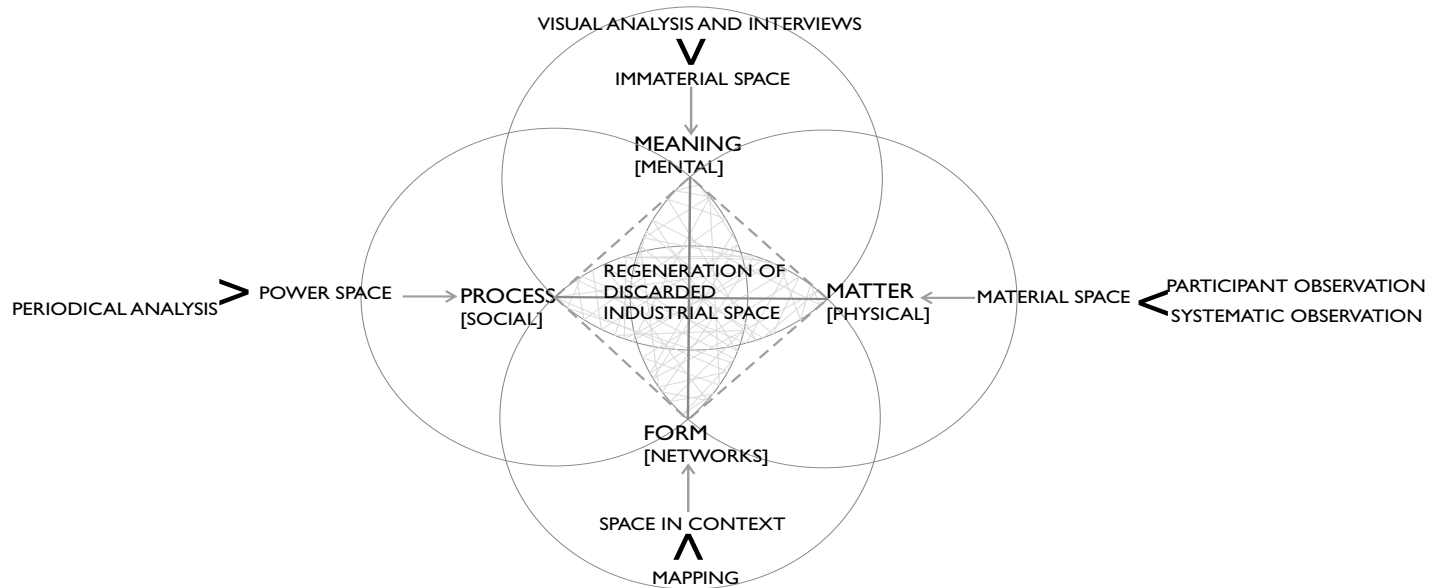


Figure 14. Visual interpretation of the methods applied to obtain the required information that is stipulated by the methodology. From: Author 2010 (visual interpretation).

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The following data-collection methods (fig: 14) will be implemented to define Capra's framework in gaining understanding of the critical issue under investigation: emergent functions in the Pretoria West Industrial Area.

Mapping:

Mapping is an act of; recording and translating the quantitative with the qualitative. The spirit of analysis with attitude engendered mapping of a whole range of diverse subjects [cognitive maps: Kevin Lynch), mapping of the everyday (Robert Venturi), psychogeographical maps :the Situationist] resulting in the visualisation of information previously thought of as either intangible or irrelevant (Porter, 2004: 114). The aim is to layer relating patterns to gain an understanding of the context and future emergence, based on the prevailing energies in the Pretoria West Industrial Area.

Systematic observation:

Systematic observation is time-and-space specific. The researcher will identify the different role-players (space, actors, activities, objects, time etc.) and through observation and memory; analyse how people use the space, and thereby identify the social patterns. Furthermore, where designers are sometimes over-familiar

with areas of study, a de-familiarisation process seems to be required, where one is again made, aware of the well-known phenomena of the everyday environment that one has grown to become ignorant of due to its familiarity (Breed, 2010: 13).

Periodic analysis:

Periodic observation is the notion of using representative media to analyse an area. The researcher will use the local newspaper to determine the main themes of the area. It is important to analyse the underlying structure of the newspaper; its aims and intentions, political agenda and target audience.

The aim of the local newspaper analysis is to determine the themes that are currently prevailing in this area. This will guide the researcher in identifying emerging opportunities in the Pretoria West Industrial Area (Rekord, Pretoria West, Jan - Apr 2010).

Visual analysis and interview:

A collage is used to heighten the visual engagement in the presentation of an idea and, more importantly, to release hidden associations in the issues of a design project (Porter, 2004: 27). The author will use the photo collage to participate in conversation and not ask direct questions, to determine the themes, values, beliefs and perceptions that are not familiar to him.

Participant observation:

In participant observation there are two objectives – one is to get involved in activities and the other to observe these activities, the people and the physical aspects of the situation (Breed, 2010: 13). An important point with participant observation is to analyse objectively and to be able to discern what information must be included and what not.

De Certeau's discussion of imagining the city is based on activity and movement, thus being involved. The concept of flaneur that was made popular by Walter Benjamin essentially involves standing back and observing at one's surroundings objectively rather than being drawn into the sensory excitement of active participation (Porter, 2004: 79).

Conclusion:

These data-collecting methods are applied to obtain the required information that is stipulated by the methodology in understanding the critical issue under investigation: emergent functions in the Pretoria West Industrial Area, and to ultimately guide the researcher in the design response.

These methods and their application will be further described under the site analysis section.

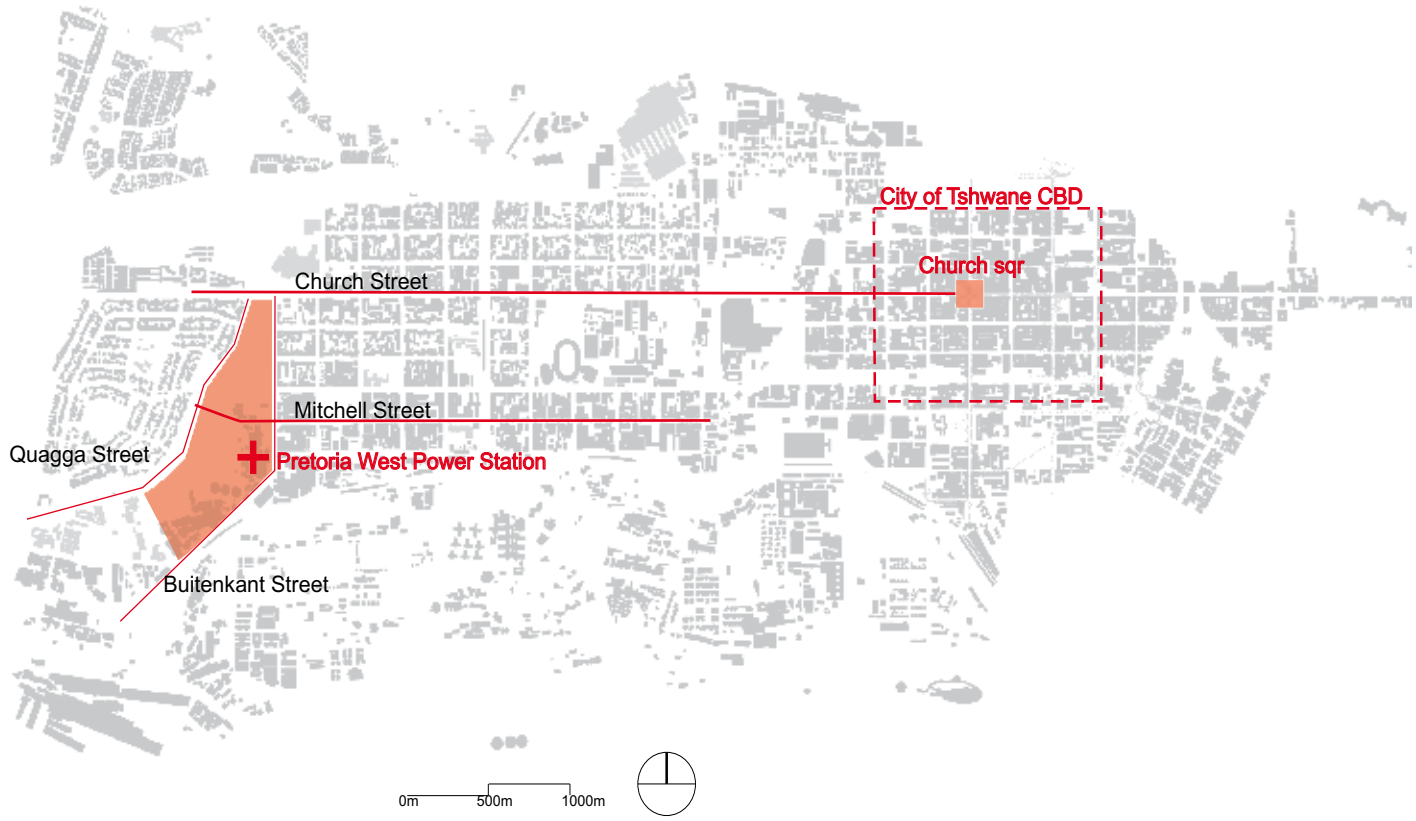


Figure 15. Pretoria West Power Station in context with the City Of Tshwane CBD. From: City of Tshwane Municipality, edited by Author 2010.

Site introduction

The study area comprises the Pretoria West Power Station (fig: 15) situated between Church, Buitenkant, Rogger Dyason and Quagga Streets and includes the contextual surrounding industrial, business and residential precincts in the Pretoria West area between D.F Malan Drive, Church, Carl and Quagga Streets (fig: 16).

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Potential:

The Pretoria West Power Station is a timepiece and emergent structure of the Industrial Revolution and holds the potential for a diverse and versatile adaptive re-use interpretation. Through its scale and location it will have an effect on the surrounding areas. This massive space invites imagination and will attract an eclectic mix of visionaries (artists, business community) that hold the potential to change the current urban decay and degradation of the area

Bio-diesel plant location:

The location of the bio-diesel plant is on the east side of the site on Buitenkant Street (fig: 17), with existing structures (fig:18) that includes the ash bunkers, workshop and boiler maintenance workshop. Due to the location of the workshops at the back of the site, these will be demolished and some of the material (masonry and window frames) re-used in the bio-diesel plant . The masonry work will mainly be re-used as a paver.



Figure 16. Pretoria West Power Station and Pretoria West Industrial Area; City of Tshwane. From: City of Tshwane Municipality, edited by author 2010.

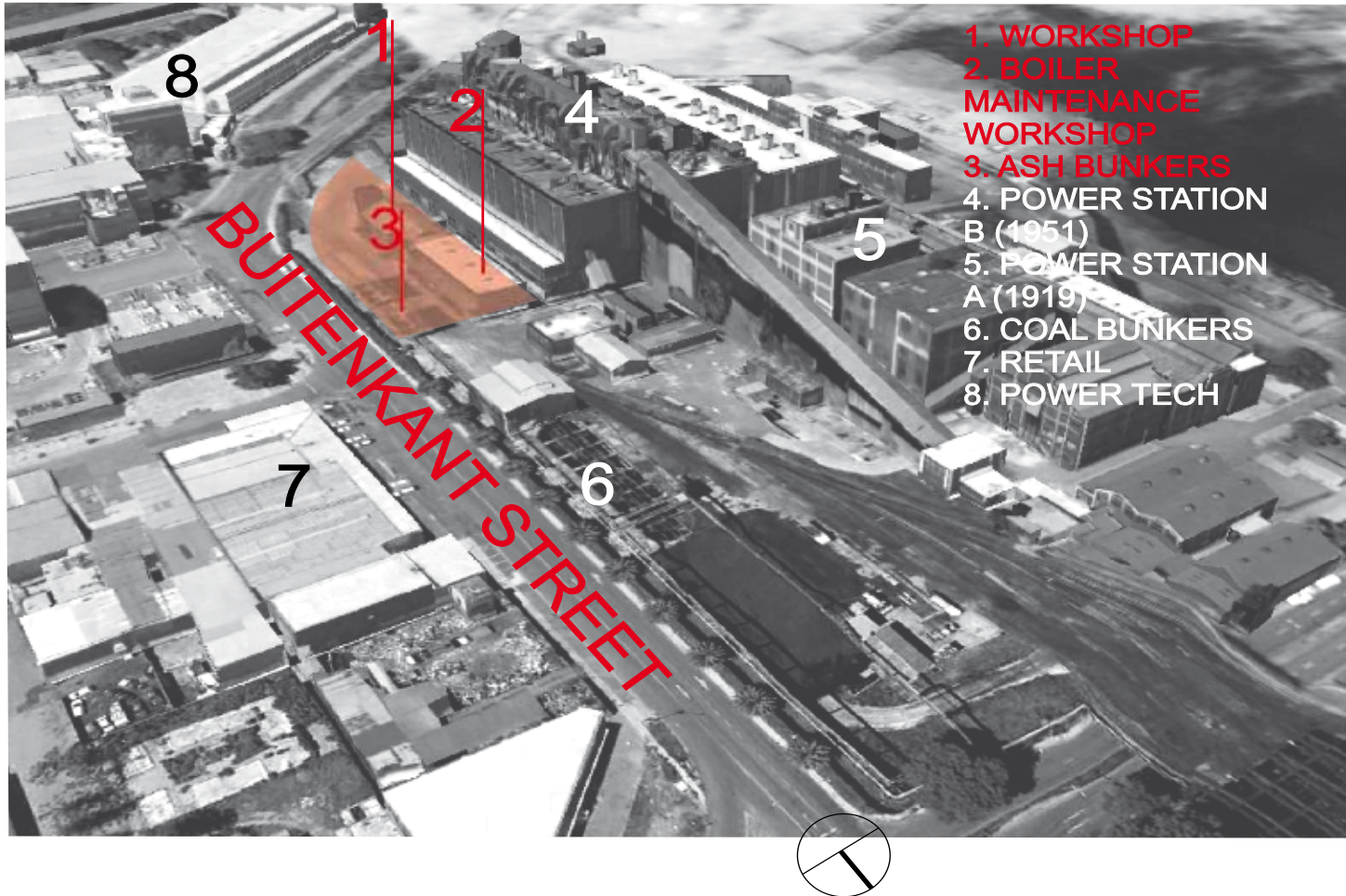


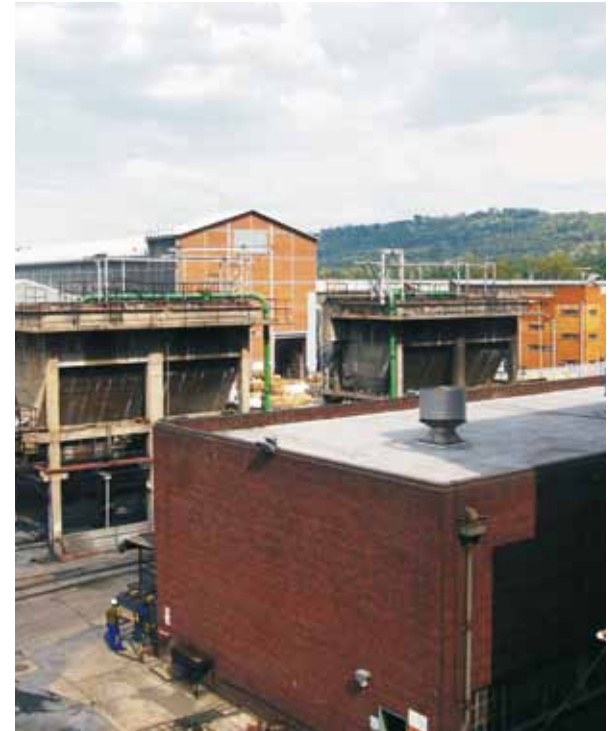
Figure 17. Bio-diesel plant on the Pretoria West Power Station site. Image from Google Earth, edited by Author 2010.

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Ash bunkers



Boiler maintenance workshop (to be demolished)



Workshop (to be demolished)

Figure 18. Photo collage of existing structures on site. By Author 2010.

Heritage

Heritage is a dynamic process and integrated into the present as much as it is a representation of the past. Lipman (2003) argues that history should be a process that is applied (analysed and interrogated) and not mimicked.

The revivalist industry is coupled with cultural stagnation. A society whose spokesmen and women – its intelligentsia – are obsessed with representing the present as a sanitised, a-social, historical version of the past is one whose leading members are incapable of confronting their social futures. Their revivals are focused on lifting themes from the past, on treating heritages as warehouses for readily re-captured meanings. For them the past is scenography. History, to the contrary, is an analytic, critical activity. Its practitioners interrogate and interpret rather than appropriate the past (Lipman, 2003: 61).

The heritage approach to the development of the bio-diesel plant on the Pretoria West Power Station site is guided by the Unesco paper 9 and the Burra charter to handle the intervention on a broad urban framework and the influence it will have on the social context of the area.

Statement of significance

The Pretoria West Power Station can be classified as a heritage site (building and site older than sixty years), and has additional heritage considerations. Its landscape features are unique to the City of Tshwane (the cooling dam, ash ponds, dramatic vegetated landscape, valuable building stock that has landmark qualities). Currently the site functions as an isolated unit in relation to the city. Yet it has potential to retain its industrial character and still be integrated into the urban environment. The framework proposes a productive environment as a heritage principle, but aims to use the site as a catalyst for urban rejuvenation.

The proposed intervention to the Power Station site and dam, with its landmark cooling towers, an extensive body of water and its close proximity to the City of Tshwane CBD, renders it a significant environmental and cultural heritage site.

UNESCO paper 9

The UNESCO paper 9 focuses on heritage as being a process of social integration and not a dead object from the past. Heritage should not be only about the buildings or structures but about integrating it into the city as a whole and making it a catalyst for the bigger urban framework of the city.

The idea that cities or historical centres of cities should be looked at as a whole rather than just as separate relevant sites led to the avant garde approach of emphasising the intricate links between heritage, conservation and harmonious development. That heritage and development are inseparable is a foreshadowing of the concept of 'sustainability' – preserving our heritage for the benefit of future generations. Culture is the bridge between the two, the vital ingredient for kneading a harmonious balance between past, present and future (UNESCO paper 9, 2002: 10).

The World Heritage Centre strongly believes that a city's identity can be a springboard for sustainable development. Achievement of this rests on eight pillars (UNESCO paper 9, 2002: 13):

1. The territorial dimension: understanding the broader picture; historical areas are linked to a greater area.

The development of the Pretoria West Power Station aim to act as a catalyst for the development of the greater Pretoria West Industrial Area to generate a much-needed diverse and integrated urban environment as a sub-support area to the City of Tshwane CBD.

2. Social development: referring to the diversity of the environment.

The Pretoria West Industrial Area predominantly comprises car related industries and the proposed Bio-diesel plant in conjunction with the other proposed light-industries in the framework, aims to ad diversity to this industrial area.

3. Empowering citizens: making people aware of the heritage in their area, even the children.

The regeneration of the Pretoria West Power Station will create the opportunity for interaction and integration of existing structures and buildings for development in the area. Awareness of the heritage value will be achieved through new programs to be accommodated in the structures and buildings (housing, train station, commercial and light industrial industries).

4. Economic development: reinforcing mixed use and creating jobs.

Mixed use is proposed for the site: housing, train station, commercial activities and light industrial industries.

5. Protecting the environment: providing public transport in relevant areas as well as providing a modern service.

A passenger and freight train station is proposed for the site that will service the surrounding housing and industrial components of the area.

6. Capacity building: strengthening of frameworks to promote conservation and development.

The proposed interventions will strengthen and add to the diversity of the area to generate development and integration (opportunities for connection) to the adjacent areas. The current mono function of the area is related to car industries, making this area obsolete and isolated to the rest of the City of Tshwane urban fabric.

7. Training: preserving craft/building methods, digital mapping, archaeological and urban planning.

The proposed intervention will be sympathetic to the existing architecture and urban fabric, where the new architecture will relate harmoniously to the existing structures and architecture.

8. Fostering international co-operation: UNESCO's strategy rests on building partnerships with the aim of forging a common vision amongst the city's numerous stakeholders.

The clear and common goal of the regeneration of the area is to add diversity that will present opportunities for connections to the adjacent urban fabric. The diversity refers to housing, light and commercial industrial industries and transport nodes.

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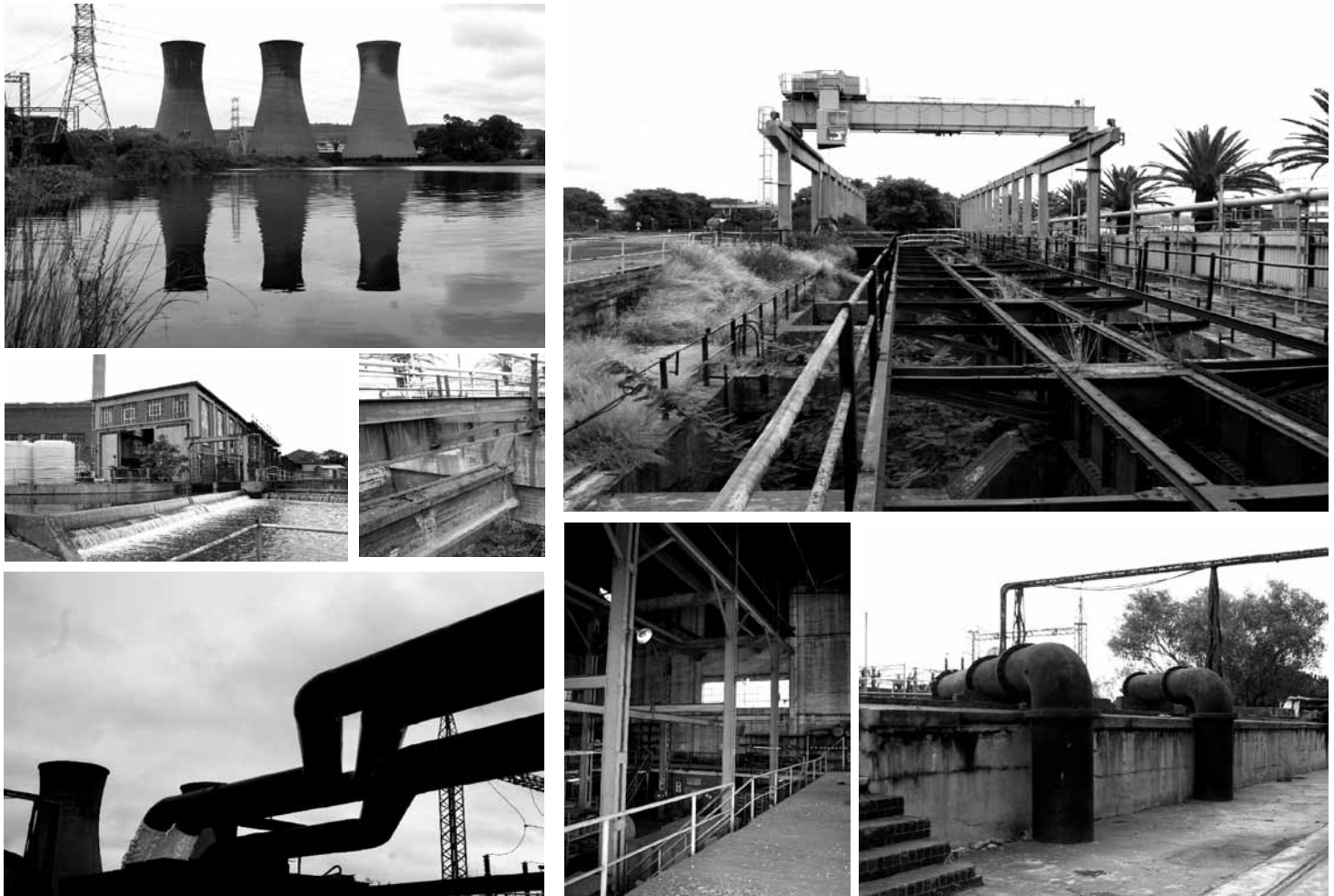


Figure 19. Photo collage of Pretoria West Power Station showing the landmark and tectonics qualities of the study area . From: Author 2010.

BURRA charter

The aim of the Burra charter is to:

- 1) ENRICH people's lives.
- 2) CONNECT the community landscape to past experiences.
- 3) CONSERVE historical records.
- 4) REFLECT on the diversity of our communities.
- 5) Highlight the fact that RESOURCES are irreplaceable and precious.

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These points refer to a dynamic and integrated approach to heritage, relating it to the social development of a community and a contributing influence to the broader development framework of a city.

Design response

The proposed bio-diesel plant will respond to and incorporate the heritage of the site by taking into account the guidelines stipulated by UNESCO Paper 9 and the BURRA charter, as discussed above. The industrial ethos of the site will be retained through references to material, proportions and connections in the proposed bio-diesel plant.

Conclusion

Heritage is a dynamic and integrated process that has relationship with the past and the future. The important concept that Morris emphasises is that heritage is about hope for the future and that it does not try to represent hope from the past.

William Morris depicted more than a century ago: what history can there be in a building daubed with ornament, which cannot at best be anything but a hopeless and lifeless imitation of the hope and vigour of the earlier world? Let us leave the dead alone and, ourselves living, build for the living and those that shall live (Lipman, 2003: 61).

The role of the regeneration of the Pretoria West Power Station within its context is to introduce mixed use developments that will complement the existing uses and establish a development destination. The site's unique features, its close proximity to City of Tshwane CBD and strategic connections present an opportunity to establish it as a hub for retail, commercial, light industry, transport and recreational activities. It will serve as a drawing card attract the aforementioned activities and to densify the area.



Figure 20. Pretoria West Power Station showing the landmark qualities of the cooling towers . From: Author 2010.

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Client

Architectural premise: regenerating of discarded industrial space.

Type: bio-diesel plant

Client: private investor

Location: Pretoria West Industrial Area, City of Tshwane

Brief:

Human demand for resources has reached unprecedented levels. The case for an architecture that is environmentally sustainable has never been stronger.

All ecologies have waste, but those wastes are actually part of a cycle. They are part of the flows of energy and the material within the ecology of the biome, and they are essential to the health and the sustainability of the biome, because these wastes are essential to and connected to the development and health of the system, they supply and power the system's development (Williams, 2007: 5).

It is time for architecture to become part of the ecology.

Purpose:

To advance the principles of sustainable living through production (industrial processes) and urban integration. The emphasis must be on the process of production and not the product in order to change our mindset of a linear production process to a cyclical one.

Aim:

The aim is to design a lucrative bio-diesel plant that will demonstrate low energy architecture, energy production and sustainable community integration