LINES, LANDSCAPE AND LORE

Waterval Boven as a case study for regenerative heritage remodelling as a strategy for small towns rejuvenation

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Waterval Boven as a case study for regenerative heritage remodelling as a strategy for small towns rejuvenation

Siphiwe Absalom Sibusiso Semelane

This dissertation has been produced with the guidance of the mentors and study leader:

Prof. Arthur Barker
Course coordinator, study leader
Department of Architecture
University of Pretoria

Submitted in partial fulfilment of the requirements for the degree Masters in Architecture (Professional)

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Location
Emgwenya (Waterval Boven), Mpumalanga
GPS: (-25° 39' S, +30 ° 20' E)

Programme
Bio-technology based additive manufacturing facility and bio-refinery lab

Study field
Cultural and heritage landscapes, human settlements

Editor
Karlien van Niekerk

"So this story will not finish with some tomb
to be visited in pious memory. For the smoke
that rises from crematoria obeys physical laws
like any other:
the particles come together and
disperse according to the wind, which propels
them.
The only pilgrimage, dear reader, would
be to look sadly at a stormy sky now and then." (Bart, 2001:49)

-André Schwartz Bart

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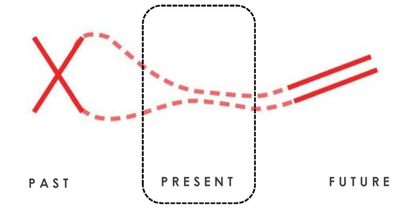

How do we **conserve** and **future proof** these heritages but most importantly how do we ascertain its **relevance** to future generations?

Fig. 1 *Author's fascination with heritage, (Author, 2018)*

01

Abstract

Approaches to heritage management in a South African context are often riddled with questions of ownership and who holds the rights to narrate which heritage (Mnyaka & Minkley, 2015, p. 57). As a result there is often an absence of awareness to the potential the built heritage has in the economic and social sustainability of a given place and or its potential to rejuvenate these if used as a resource for (re) development.

This dissertation will explore regenerative remodelling of heritage as a strategy to revitalise the economy, ecology and the cultural as well as the social landscape of the 19th century railways town of Waterval Boven in Mpumalanga, South Africa.

Regenerative remodelling theory is situated at the intersection of heritage, resilience and future perspectives for the rejuvenation of place. The dissertation is an exploration of this intersection through a bio-technology based additive manufacturing industry as a catalyst for an ecological and sustainable industry that will see the rejuvenation and future proofing of post-company/ industry small towns in South Africa.

Keywords:
Heritage management, regenerative, remodelling, sustainability, rejuvenation, bio-technology, additive manufacturing

Programme:
Bio-technology based additive manufacturing facility and bio-refinery lab

Site:
Emgwenya, formally, Waterval Boven historic town centre (-25° 39' S, +30 ° 20' E

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Declaration

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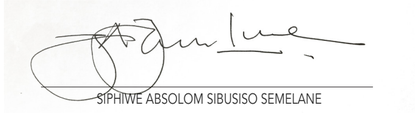

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the wisdom
the accommodation and the time you have made available to listen to my passion
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To my companion, my partner, my friend.
Helga, you've been the rock beneath my footing. For all the love, laughter and life outside the making of this work, I thank you for reminding me that "we are awesome people"

To my family,
khabo nduku siyathela ngithi ngiyabonga for uthando nosekelo l'wenu.

Mama,
Ndlonkulu,
lena heyakho

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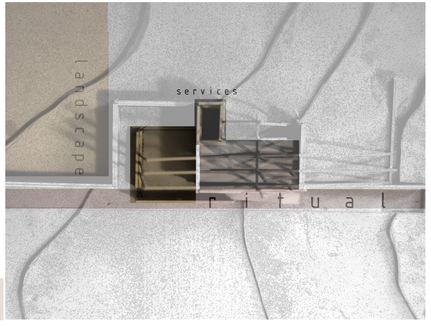
Author's Manifesto

"The first act of architecture is to put a stone on the ground. That act transforms a condition of **nature** into a condition of **culture**. It is a holy act" (Mario Botta).

Architecture is the idea formed by **narratives of people and place**. It holds the **social responsibility to retell** these narratives through **sustainable place making**.

These ideas are further bound by **time** which is expressed through the **rituals of the inhabitant.**
Ritual that is articulated by the meeting of man and his route that leads him to his spaces of being.

Architecture is thus **confrontational to its context: people, place and time**.
Architecture is thus always **political**



02 **Fig. 2** *Representation of the author's manifesto in model form, (Author, 2015)*

03 **Fig. 3** *New train weaves through the Elandskraans escarpment. (Boven se Storie in Beeld en Woord)*

Preamble

A snake cloud hovers in the meanders of the high-veld mountains and valleys and rivers moving at a pace of a creature lurking with an admiration to the charm of the waterfalls and the hills and the houses and people. Beneath the snake a carriage of migrant workers from many a city or country or far away land, brought here, to Waterval Boven, to be cosmopolitan and share in the riches of the NZASM built rail enterprise and the gold and coal of the Transvaal (De Jong, et al., 1988: 63).

The cloud is no more and the riches of steam have dwindled. The Belgian steel (De Jong, et al., 1988: 49) that once traversed the Transvaal escarpment now serves as fence posts to the new rail enterprise or supports for waning type houses or towers for water tanks. Sturdy remnants of the glory days of the NZASM enterprise bent to its knees by the politics of the day (Clarke, et al., 2016: 17).

A sad town with an illustrious history remains. Hinging to existence from a thin thread of its attempt at second lease of life, eco-tourism, from which neither the nostalgia filled folk sipping tea in the former single- men's quarter's building; nor the old miners in the elephant houses nor the new inhabitants once attracted by the charm of the rich history, stand to benefit. If anything, the charm of the houses and the streets and the archaeological finds are threatened with the curse of indifference, neglect and subsequent demolition. A housing crisis threatens the historic urban form through a proposed sprawling RDP development (Emakhazeni Local Municipality, 2015:89); disinvestment from the private sector has occurred due to urban decay. The eventual threat to the built heritage fabric that makes up the town is eminent. Someone needs to remember not to forget.

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Chapter 1
Introduction

The NZASM Tunnel seen from the four-lane highway linking the Eastern Transvaal with the Highveld.

THE WATERVAL BOVEN RAILWAY TUNNEL

a link with the past

With the advent of the railway early in the 19th Century, railway tunnels became an engineering necessity. The first tunnel in Britain to be associated with a rail link was driven in 1826 for the Liverpool-Manchester line. The railway age came to South Africa somewhat later in the Century but, by its closing decades, several tunnels were in use. One of these, the Waterval Boven Tunnel, is today a National Monument. Its construction and early years of operation are described below.

04 Fig. 4 *Article from the "South African Tunnelling Supplement to Construction in S.A, March 1977 (Boven se Storie in Beeld en Woord, unknown)*

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05

1.1 Introduction

In the context of South Africa, heritage is often contested with questions of ownership and who holds the rights to narrate which heritage (Mnyaka & Minkley 2015:56). A lack of awareness exists of the potential that the heritage holds for the economic and social sustainability of a given place and its potential to rejuvenate these if used as a resource for (re)development.

This is especially the case in the over five hundred post-industrial/company towns in South Africa. The decline of these towns is almost immediate after the cessation of the activities of said company and or industry. The original inhabitants move out, abandoning a myriad of buildings and sometimes entire towns. These are symptoms of what the author terms as the small town's condition.

The research of the dissertation begins by exploring the symptoms and causes of the small town's condition through case studies of three small village towns including and of the scale of Waterval Boven in order to situate the theoretical premise of the dissertation, and therefater will explore regenerative remodeling in Waterval Boven as a case study to address similar conditions within the South African landscape.

Fig. 5 *"Bain's Railway Map of South Africa (www.digitalcollections.lib.uct.za)*

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1.2 Problem statement

Small towns is South Africa suffer from the inability to overcome change, leaving them distraught and in disarray. As a result the towns do not form a part of governmental planning policies despite the fact that they have been earmarked as important centres for the alleviation of poverty and rapid urban migration (Atkinson 2008:6). The misfortune of the decline of the small towns is the loss of livelihoods, functional urban centres and most importantly the built heritage that is often inherent in these towns.

1.3 Research Questions

In the dissertation, the intersection of heritage, resilience and future perspectives are thus investigated through prompting what a strategy for the economic, ecological and social rehabilitation of Waterval Boven and in extension, small towns is South Africa, looks like. How does this strategy ensure the protection of heritage as well as its value for future generations through future-proofing mechanisms that will see the post-industrial town survive change and development?

Sub-Questions:

How does the regenerative remodeling strategy ascertain the protection of the heritage of these towns? How does this heritage move beyond objects of beauty but become part of a value adding urban ecology for future generational use and appreciation? through future proofing mechanisms that will see the post industrial town survive change and development? How do we maintain the relevance of the heritage for the future?

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1.4 Methodology

Various research approaches are employed to generate the respective content in support of the eventual goal of testing the proposed methodology for the economic regeneration of Waterval Boven. In that respect, an over-arching simulation research methodology is employed, complemented and supported by the methods in the sections below:

1.4.1 The small town's condition

In this section the evolution of the small town's conditions will be discussed in the context of historical towns in South Africa. Here the dissertation methodology takes a hybrid form - combining a correlational[1] as well as casual comparative study[2] between three post – industrial – company towns, including Waterval Boven, in a South African context. The chapter will be concluded with best practice advice which will usher in the proposed strategy.

1.4.2 Regenerating Place

In this section of the dissertation the regenerative remodeling approach towards the rejuvenation of settlements will be situated within a continuum of theoretical discourse in the following conceptual frameworks: heritage and conservation; resilience thinking, identity and story of place, experiential potential of heritage and cultural tourism and finally heritage and narration. These conceptual frameworks will be interrogated via the lens prescribed by the Regenesis group, termed regenerative development.

1.4.3 Story of place

In this segment historical analysis methodology is employed as a tool for the making of the story of place. The author makes use of the following tactics to ascertain the factuality of the narrated story of place: documents; academic literature; recollections from persons, photographs from various archives and persons; comparisons to similar contexts in space and time and visual comparisons and a reading of patterns. Secondary sources such as public participation reports conducted by government consultants as well as the RSDF compiled by the government will inform the compilation of present-day stories.

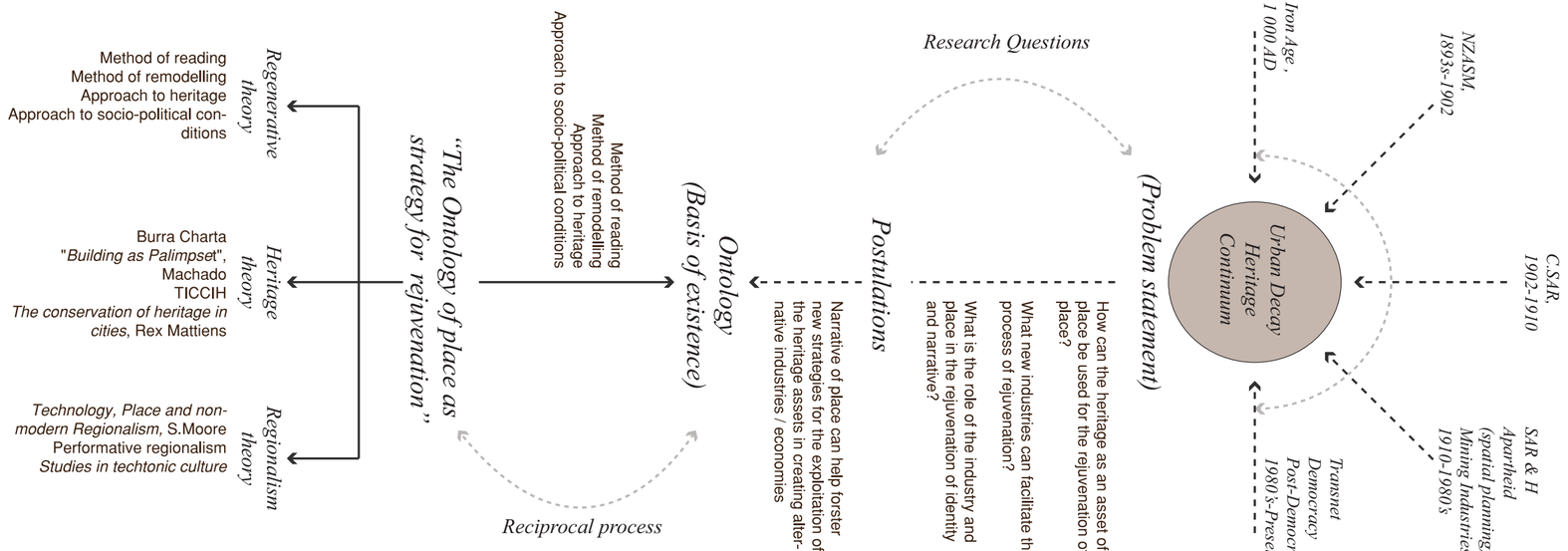

Fig. 6 *Methodology for dissertation approach*

1.4.4 Monuments moment

This section contains an interrogation of the spatial layout of the town, from pre-history to present, and the potential it has in providing the cultural- and eco-tourist with a wholesome experience of the history of the Transvaal in various moments. Here the author relies on literature along with consultations with archaeologist for insights on the prehistory of the town as well as the hidden practices of the present day communities. For the generation of the narrative, statement of significance and experience model, the author will have to translate the information presented to him and will rely on what Kafle (2011:181) describes as the hermeneutic phenomenology to translate the information into both narrative and eventual architecture.

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1.4.5 Precedents

Case studies are chosen based on the questions that need to be answered in the paper in a particular section of the book. Here Sarvimaki's *holistic instrumental case study methodology* is applied which dictates the selection and discussion of the case study based on the hypothesis predetermined by the relevant section of this book. (KAFLE, 2011: 181)

1.5 Delimitations

Although the entire town as well as the township will be included and considered as a coherent ecological urban system, the urban investigation will be limited to the business district – spanning one house deep on either side of the main road; the historic core of the town, and its various precincts and the promenade linking the town to the waterfall, cutting through culturally significant sites across the township.

Architecturally, the design focus will be on the historic core close to the station, clinic and library. The solution prescribed in the dissertation will be articulated by a number of interventions within this focus area.

1.6 Assumptions

Several assumptions for the purposes of the exploration: It is assumed that the plans by the Mpumalanga government to reinstate the passenger train are to be effected and thus the possibility of a larger user group is present.

It is also assumed, for design purspose, that the presence of aloes and other succulants in drier areas of the site is suggestive of low magnesium rich topsoil with greenstone bedrock underneath, neccesitating alternative design solutions todeal with the founding of buildings as well as water percolation.

In the same breathe, the sharded escarpment is read as a sign of fractured or fracturing bedrock, making the escavation of the ground less laborious and thus less expensive (consultation with geotechnical engineer).

1.7 Limitations

The author acknowledges the limitations of the study as follows: Due to safety and privacy issues, the acquisition of buildings plans for some of the existing buildings represented herewith was not possible. This limitation does not affect the research conducted but is merely missing architectural information. The author thus makes assumptions based on studying the elevations of said buildings and measuring perimeter walls.

[1] Wang describes this methodology as one where the researcher simulates actual environments as a testing ground the question at hand. It is the "representation of how things could be rather than what they are" (Groat & Wang, 2013) with the benefit of not suffering any causal damage to the context in question.

[2] Correlational study is defined as the use of statistics to clarify patterns of relationships (Groat & Wang, 2013) whereas casual comparative study is research through observing naturally occurring patterns (Groat & Wang, 2013). This segment of the dissertations employs both these methods: unpacking statistical information about Noupoort and Pilgrim's Rest and comparing it to Waterval Boven of which statistical information is not fully available, thus observational tactics, inspired by the former statistics, are employed.

[3] A research methodology that translates the individual interpretation of a particular experience into the collective event (Kafle, 2011: 181)

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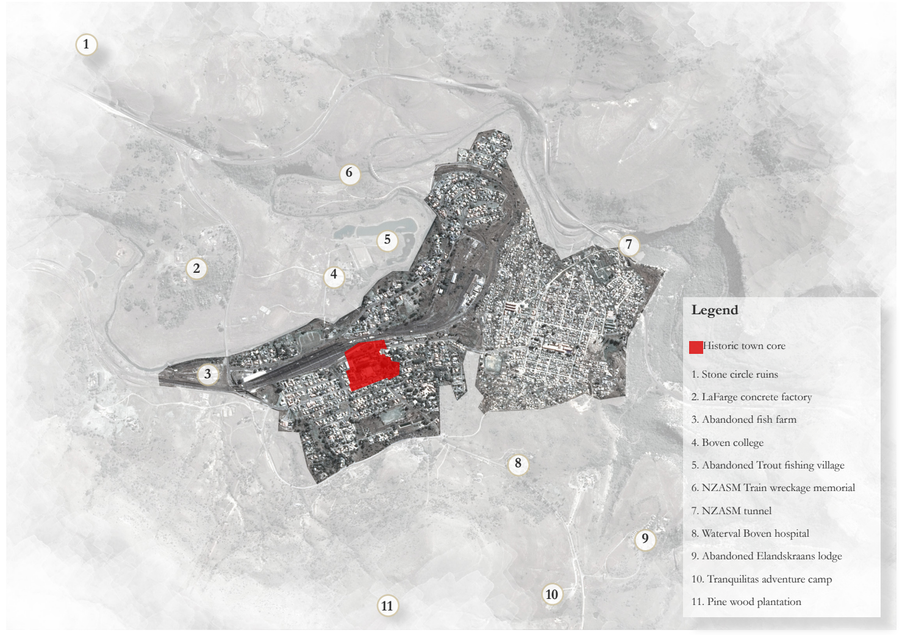
1.8 Site + context

The dissertation began with a question and hypothesis of regenerative remodeling and thereafter searched for a small town befitting of the small towns condition discussed in the next chapter.

Waterval Boven a small, former railways town, is located 283km East of Pretoria. The town is befitting a testing ground for the dissertations hypothesis in that it is expressly typical of the small town's condition exhibiting a rich history as a post-industrial/company town experiencing decay in its social, political, economic and environment.



07 **Fig. 7** *Dissertation study area (Author, 2018)*

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08 **Fig. 8** *Earliest satellite imagery of Waterval Boven, one can see the oldest part of the town still in tact and the absence of the township is also recognisable (Department of Forestry and Land Affairs, GIS, 1938)*

1.9 Proposed Programme

Programmatically, the dissertation sees the programme as an integral part of the regenerative remodeling exercise. It should part take, with equal importance, in the generation of life-enhancing practices for the inhabitants of the town as well as the built and natural environment.

A bio-technology based additive manufacturing facility and bio-refinery laboratory are explored as agents of the economic, social and ecological rejuvenation of Waterval Boven. The programme is structured in a manner that actively engages the everyday spaces of the town, old and new, and is envisioned to be entrenched in the culture and experience of the town just as "spoorweg sinoniem was met Waterval Boven" (Geyser, 2002: 73) (railways were synonymous to Waterval Boven)

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1.10 dissertation intentions

1.10.1 General intentions

The general intention of the dissertation is to critique present day heritage approaches in South Africa through a simulation of an alternative approach – regenerative remodeling to illustrate the benefits of a different lens to heritage management and ecology of place.

The dissertation is thus an attempt at making regenerative remodeling theory practical and applicable so that the process could be replicated through other town of similar conditions.

Finally, the dissertation is intended to alter the perception of heritage being an obstacle to development but rather a tool to facilitate development that is contextually biased and thereby maintaining and sustaining and improving the identity, ontology and story of place.

1.10.2 Urban intentions

The urban intention of the dissertation is to use the new process-driven programme as a catalyst for regenerative (re) development of Waterval Boven. The manner in which the programme is applied to the urban imagines a (re)industrialised Waterval Boven wherein industry is entrenched into the everyday. The programme on an urban scale is also intended to better connect the township (Gugulethu) to the town centre through industry and public space.

1.10.3 Architectural intentions

The architectural intention is to test the remodeling theories of Machado (Machado, 1976) and Roos (Roos, 2007) that spawn an architectural brief grounded on palimpsest and story of place, inspiring an architecture that would not be alien to place nor be so fitting that it isn't testament to present day spirit of the time. In so doing the architectures intention is to be accepting of the challenges presented by the historical and ontological typologies of the existing buildings and, through remodeling, to accentuate the old and architecturalize an otherwise industrial architecture.

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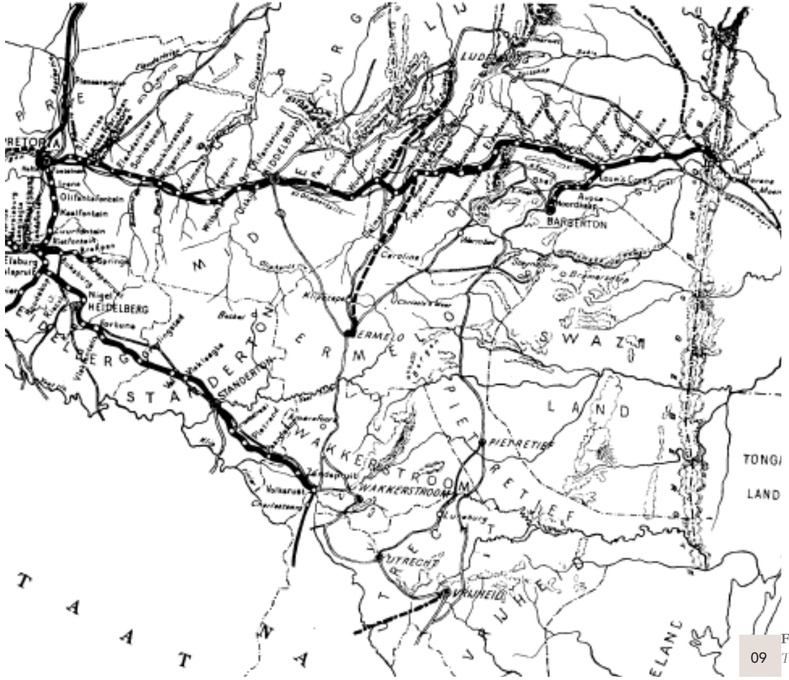
Chapter 2

The Small Town's condition



09 Fig. 9 *Map showing all the NZASM trajectories across the then Transvaal province (De Jong, et al., 1988)*

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Introduction

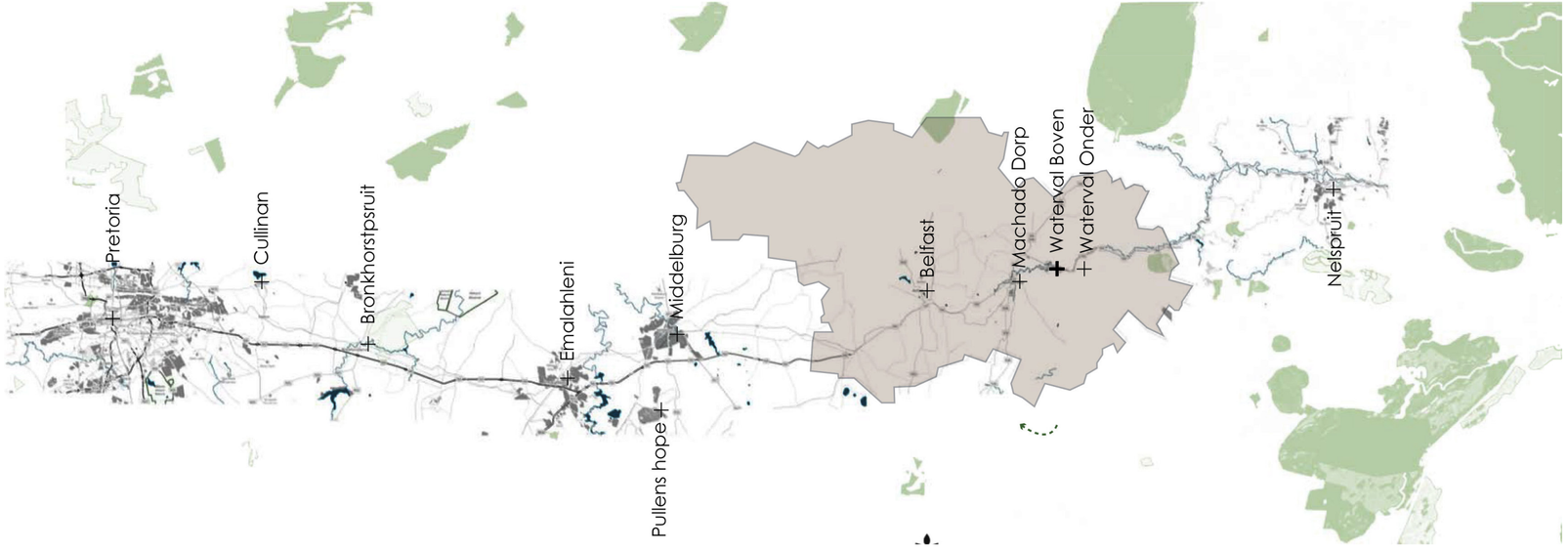
Small towns in South Africa usually suffer from the inability to overcome change, especially changes in the form of economic and political shifts. As a result of these changes, they're often left neglected in planning and policy making processes on a regional governmental level (Atkinson, 2008: 8) which results, at a local level, to economic decline, poverty and the subsequent decay of the built environment.

Economy

The post industrial town can thus be seen as a non-resilient entity as it typically undergoes a cycle of birth and success, on the back of industry; sometimes a second life in the form of a tourism town and eventually suffer an imminent death without entertaining the prospects of a rebirth aided by inherent spatial and resource conditions (Bernstein, 2000: 4).

The first and probably most important change is one that characterises these towns as "post"-company/industry. As in the case of Waterval Boven, and similar cases discussed below, the shift in economic status is caused by the cession of said company/industry often leaving the towns distraught (Bernstein, 2000: 4).This can be attributed to the mono-functionality of the economies in these towns to begin with (Atkinson, 2008:9). A condition which persists to this day when the towns become solely reliant on a tourism industry.

A second example of such a change is the political perception towards the significance of the economy of small towns. In other words a political shift. Often, these perceptual shifts occur concurrently with the shift in the industry or cession of company responsible for the industry, thereby changing the political attitudes towards said town or even towns in general (Bernstein, 2000: 4).



10 **Fig. 10** *Map showing regional locality of Waterval Boven. The brown shaded region illustrates the extant of the Emakhazeni municipality and the green illustrates conservation systems in the province (Author, 2018)*

In 1960's South Africa, for instance, the political attitude was that of a "positive development image" attributed to the town's industry/company's hay days. This perception shifted to complete disinterest twenty years later when in the 1980's (Atkinson, 2008:9) many a company or industry ceased due to technological disruptions which saw a massive change in industry or complete overhaul thereof. In the case of Waterval Boven this happened during the automation and electrification of the railways network of the NZASM in the 1960's already (Berr, 2015: online). This meant that the need for centres such as Waterval Boven, servicing the trains along the Eastern trajectory became redundant.

Currently, the argument held by government and planners is that small towns have a key role to play in the development of rural and peri-urban areas as well as surrounding villages and farms (Emakhazeni Local Municipality, 2015: 256).

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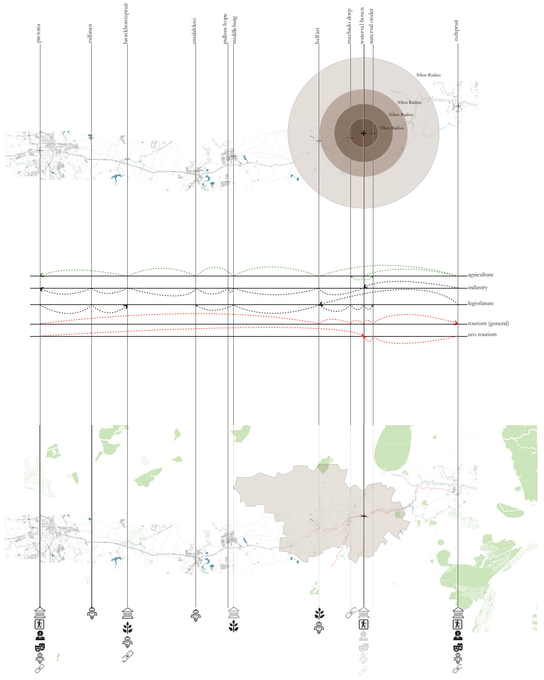
Local authorities and planners agree that these small centres have an immense capacity to absolve the rapid rates of urbanisation in the country by providing alternative centres of opportunity for those seeking it (Bernstein, 2000: 4).

This perspective sits squarely on the back of figures that illustrate that over 3.3 million people live in an around the 500 small towns across the country (Bernstein, 2000: 4) necessitating a review of the governments perspective towards the future of these towns despite their history.

This breath of a new and optimistic perspective is the driver for the recent shift in government policies towards a need for sustainable local economic development (LED) strategies for the economic renewal and sustainability of the post-company/industrial towns (Emakhazeni Local Municipality, 2015: 301).



Waterval Boven

third order town (tertiery service centre)

As a tertiary service centre (third order town), Waterval Boven should successfully provide the following services:

Eco-tourism and affiliated tourism (mountain biking etc.) is sustainable due to picturesque nature of the town. There is however a missed opportunity in eco-tourism related economies

Municipal services come in the form of the local clininc, hospital, magistrates court and police station as well as a library. The services are in poor condition and bare:y adequate for the service area

There is one **social welfare** program provided by government to help support the community in its ambitions, ills and to provide support for the unemployed and depressed

There is no **cultural activity** in the town apart from the informal activity in the township as well the school related cultural activities. There is also no exploitation of the cultural heritage assests in the town and surrounds

The only **industrial/ technology/innovation** affiliated with the town is the works of the railways whih is governed by Transnet. This blue collar industry is has a large share in the number of employed people in the town.

The town provides no **connections** in terms of transportation exchanges; opportunites, business etc. The school of tourism at the Waterval Boven college is a good starting base and way to think about connections.

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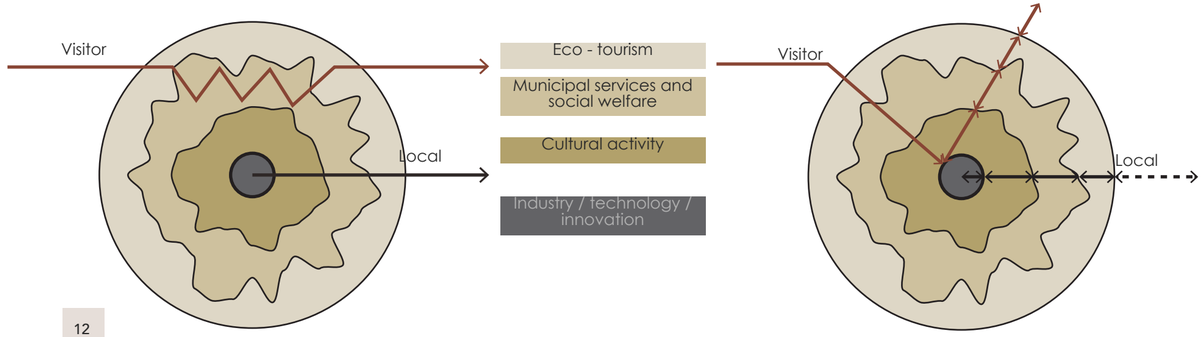

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Fig. 11 *Diagram illustrating the present day functional ontology of Waterval Boven*
Fig. 12 *Left, current local and visitor relationship to the various services the town provides. Right is the desired relationship of locals and visitors with place.*

Small towns - society

To situate the uniqueness of Waterval Boven as a case study, one needs to have a comprehensive understanding of the social conditions of post – industrial/company towns in South Africa.

Legally and politically, the definition of small towns in South Africa is threefold: firstly it is defined as a town within a commercial farming district, often experiencing economic decline or secondly, a former homeland, usually unconnected to agriculture or thirdly, a "dense homeland area" which lacks services and facilities (Bernstein, 2000: 5).

Whilst many a small town in South Africa would occupy a singular place in one of the above definitions, Waterval Boven interestingly weaves between all three definitions in that it is a historic town amid farm and industrial activity. It also serves as a "third order" town to neighbouring townships, in other words, provides all tertiary sector services to these townships including its own townships of Emgwenya and Gugulethu (Emakhazeni Local Municipality, 2015: 305).

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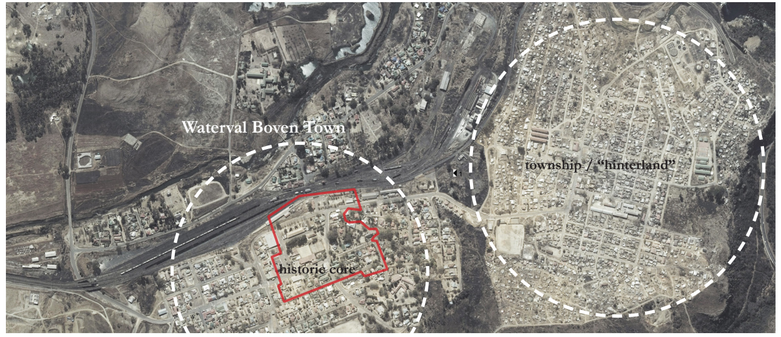
The third and crippling characteristic of the small towns condition is the still well preserved legacy of the apartheid spatial planning (Bernstein, 2000: 6). The towns are always accompanied by a township or "hinterland" as Bernstein recalls (Bernstein, 2000: 6), which is often under serviced, informal in its urban growth and politically neglected. Bernstein even goes to the extent of likening these towns to "mini-citadels of apartheid" (Bernstein, 2000: 6) where little or nothing is actively done to improve the socio-economic relationships between the town and its township to eradicate the spatial and consequent social divide.

In Waterval Boven an interesting relationship exists between the town and its hinterlands in that due to the disinvestment in the town and a stuttering tourism industry there is no entertainment in the town proper. Nor, at the time of this dissertation at least, are there any restaurants or eateries or any form of night life in the town. All of these activities happen in the township. Conversely,



13 **Fig. 13** *Waterval Boven Town and township (Author, 2018)*

there are no municipal services, with the exception of schools, within the township. This relationship, facilitated by the sole street link between the township and the town, fosters a constant movement between town and hinterland. A relationship which has resulted in a rather harmonious interaction between the communities of the township and the town. A unique small towns experience in South Africa. "If small towns are left to entropy, there will emerge a politically polarized and economically unstable set of conditions…and the lost opportunities for growth, development and racial reconciliation" (Bernstein, 2000: 8) warns. Waterval Boven does not have these challenges in the express manner that Bernstein refers to and thus presents itself as an ideal location to test the hypothesis of this dissertation.

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14 **Fig. 14** *Waterval Boven Town and township (Author, 2018)*

Case Studies

Pilgrim's Rest

Pilgrims Rest is a former mining town established circa 1873 after the discovery of gold in the then Transvaal province (Province, 2017: 268). It became home to mining prospectors and their families during the Gold rush period in the province. The town falls under the category of "Platteland" towns which Bernstein defines as those towns whose ontology is to service surrounding areas (Bernstein, 2000: 8), like Waterval Boven.

Industry, in Pilgrims Rest, gave way in the 1970's when the gold fields got depleted (CHL Consulting LTD, 2007: 22). The town thus, in typical small town's style, was converted into a booming tourist centre reminding the visitor of the olden days of steam trains and gold miners. The town has since remained stagnant in terms of development which has, in the recent past, led to a very sharp decline in the towns ability to sustain itself, its inhabitants and the built heritage it houses.

This decline, along with the negative shift in political sentiment, has led to poor livability and serviceability of the town which in turn has deteriorated its tourism product offering causing the town to eventually lose its National Monument status, as declared in 1970 (CHL Consulting LTD, 2007: 23). The town was relegated to a Provincial heritage site in 1999 due to unpopularity and public opinion albeit its synonymous title of being the country's "most successful living museum" (Province, 2017: 272).

Low development levels have led to a very high unemployment levels. This is also exacerbated by the fact that the town is in the sole custodianship of the government meaning that all financial burden for development and heritage management rests on the state (Province, 2017: 273). Pilgrims Rest's population in the town proper has seen a steady decline in the main but as is symptomatic of the small town's condition, the inverse is true for the township, where there is a sharp increase in the population settling informally in the area (Census). The township is under serviced and thus suffers rampant poverty and relies on the town proper for the provision of all services (Province, 2017: 273).

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NouPoort

Noupoort, like Waterval Boven owes its existence to the railways industry. It was established as a service centre to the South African Railways (SAR) company in 1852 (Fischer, 2014: online). Like many a company town, Noupoort's economy revolved solely around railways activity up until the 1960's during the automation and electrification of the rail networks in the country. This led to a decrease in the demand on the network onto which the town falls which subsequently led to a decline in socio-economic conditions and spiked poverty rates (NoupoortWIKI).

In 1992, a religious community with assistance from the state established a drug and rehabilitation centre which brought relief in terms of job creation and attraction of foreign investment into the town (NoupoortWIKI). In 2008, when Atkinson's paper on small town economies was published, the town was listed by that research as having a "deteriorating economy with an increasing dependency on social grants" despite the new ontological function of the town (Atkinson, 2008: 12).

Between 2014 and 2016, the state, in partnership with international bodies, made an investment into the town in the form of a wind turbine farm just outside the town as part of their LED strategy for the area (Noupoortwind, 2016: online). The project would not only facilitate in job creation but become a constant investor in the local schools and community projects and also provide financial assistance to local start-ups (Noupoortwind, 2016: online).

Whilst the former strategy was appropriate in dealing with social issues of the town, it didn't sufficiently corroborate with the component that kept the town alive to date: industry. The second injection proved more sustainable and is affording of longevity due its pragmatic approach in addressing the issues of the town on the spheres of economy, sustainability, and the social realm. A conclusion drawn by Atkinson's paper on economic opportunities in small towns (Atkinson, 2008: 14).

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Fig. 15 *Noupoort's railways history is still prevalent in the town. Trains still get serviced here. Like Waterval Boven this doesn't change the economic and social disparity of the town (Google images)*
Fig. 16 *Consultation with local township dwellers before the establishment of the Noupoort wind project (noupoortwind.co.za)*

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Waterval Boven (small towns condition)

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Fig. 18 *Liquor store on First Avenue across from library. There are several liquor stores in the town as well as the township. (Author, 2018)*
Fig. 19 *Former fish-market hall that was operational during the towns fame as a trout fishing haven, now run down due to the decline in trout fish farming. (Author, 2018)*
Fig. 20 *First Avenue, the main street of the town, illustrates good urban environment but badly maintained. The road infrastructure is worn down. Post Office building is seen on the left hand side as an example of later additions to the town.. (Author, 2018)*
Fig. 21 *Example of the red-brick housing that arrived with the S.A.R & H period, a mining house typology . (Author, 2018)*
Fig. 22 *NZASM type house adapted to communal housing for Portuguese mine workers during S.A.R &H period. (Author, 2018)*
Fig. 23 *An example of a high ranking official residence from the NZASM period, whilst it is well kept it has been standing vacant for a while. (Author, 2018)*

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Fig. 24 *The local sporting area for the township community (pictured is the terraced netball court. (Author, 2018)*
Fig. 25 *Thus is said to be the oldest church in the township although no documentation can confirm this. (Author, 2018)*
Fig. 26 *Insensitive additions to C..S..A.R building, story of building unknown. (Author, 2018)*
Fig. 27 *Overgrown NZASM tunnel at the edge of the township across the freeway. The tunnel is rated as a National monument. (Author, 2018)*

Fig. 28 *NZASM type house in decay due to being vacant for too long. (Author, 2018)*
Fig. 29 *A streetscape in the newer part of the township. (Author, 2018)*
Fig. 30 *A better example of sensitive additions to place. Pictured is the local old age home comprising of three NZASM< type houses built in stone joined together by a face-brick addition of a colour similar to the stone. The stoep and chimneys of the old building are hardly recognisable. (Author, 2018)*

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Fig. 31 *Image of the scenery which facilitates the eco-tourism of the town. Pictured in the foreground is the new railways bridge built during the SAR&H period when automation, electrification and new technology allowed the trains to traverse the topography with ease, making the meandering lines of the NZASM redundant as seen by the old NZASM bridge (only piers visible here, originally in stone and later clad in concrete) in the background. (Author, 2018)*

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32 **Fig. 32** *Building stock technical condition illustrating the amount of building stock that is in bad condition due to neglect, vacancy or general disinvestment. (Author, 2018)*

Conclusion

Atkinson concluded her study through proposing this four faceted methodology towards the making of a working strategy towards the rejuvenation of small towns (Atkinson, 2008: 23):

a) A productive government spending focused on local production and multipliers in the form of tertiary services like orphanages, old age homes, recreation centres, prisons, technical colleges or tourist facilities,

b) investment opportunities from private stakeholders, in other words, the encouragement of public private partnerships (PPP's) as these will foster opportunities for the growth of small, medium and macro enterprises (SMME's) and subsequently provide employment,

c) a clear understanding of regional dynamics – the ontology of the town within its broader context

d) and finally the creation or assistance of a second economy via empowerment organisations such as the small enterprise development agency (SEDA) which will support SMME's.

Main Issue

Despite its historic wealth and subsequent second lease of life as a tourist destination, Waterval Boven remains a poor town, under serviced and underemployed.

The question thus is: how can the character of the built heritage in Waterval Boven serve as an inspiration for the rejuvenation of the local economy and foster a development that is inclusive of the everyday inhabitants of the village? What strategies, on an urban as well as architectural scale can be employed to strengthen the resilience of the town in order for it to work with change over time and not against it? How can these strategies assist the town in becoming less dependent on a volatile tourism economy but rather re-imagine a town for the locals that can accommodate visitors?

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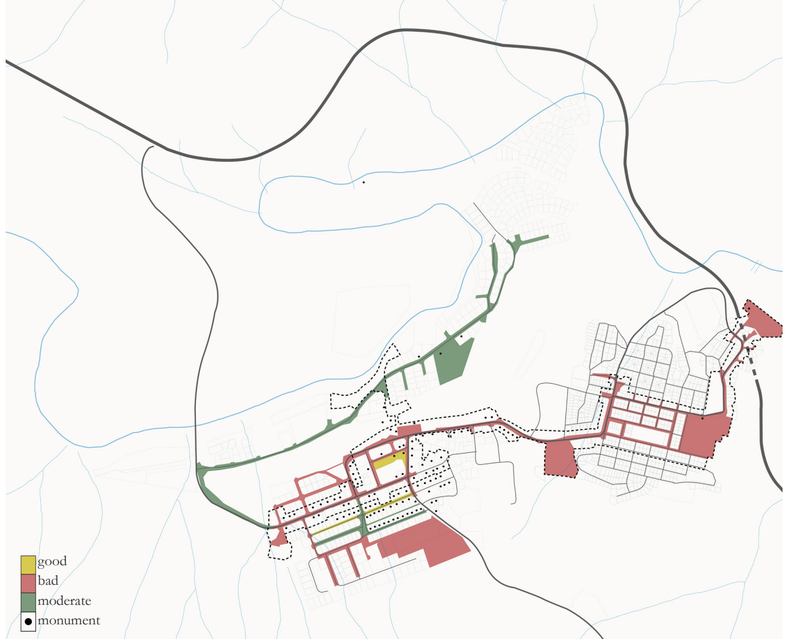

33 **Fig. 33** *Public space technical condition illustrating the condition of public spaces including streetscape and parks. Negative conditions are symptomatic of neglect, vacancy or general disinvestment (Author, 2018)*

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34 **Fig. 34** *Land-use analysis. Illustrates mono-functionality and vacancy in the town (Author, 2018)*

Urban Issue

Like many towns of its scale, especially across the global South, Waterval Boven is succumbing to a population spike. An immense amount of people are moving into the town on an informal basis, despite the minimal or even lack of employment opportunities in the town (Census). This migration exerts pressures of urban expansion (Throsby, 2016: 82)and thus pose an immense threat to the heritage assets of the town.

Throsby reminds us that it is not uncommon for these heritage assets to be seen as "standing in the way of development" in these towns, especially considering the identity of the heritage as perceptually "colonial" (Throsby, 2016: 82). Jean-Paul Corten of the (the Netherlands Cultural Heritage Agency, 2014) substantiates this phenomenon and attributes it to misguided perceptions, by locals and authorities, when it comes to heritage where the heritage is seen as a hindrance to development rather than an opportunity to enhance character of place, especially in cases where the reliance on tourism as an industry is a factor (the Netherlands Cultural Heritage Agency, 2014: 36)

The built heritage in the town is thus subjugated by the lack of awareness of its significance, meaning and character to place. Thus, often times, development frameworks proposed (see fig.) for the town neglect the historic significance of the built heritage as a part of future planning. In Waterval Boven it is development through sprawl which not only threatens the character and historic structure of the town and further deteriorates the identity of the town but also stretches the already strained resources, municipal and otherwise, of the town thinly.

An approach to re-centre and re-establish the logic to the town is necessary. Not only as a means to protect the heritage but as a strategy to use the heritage as a tool to inspire future (re)development.

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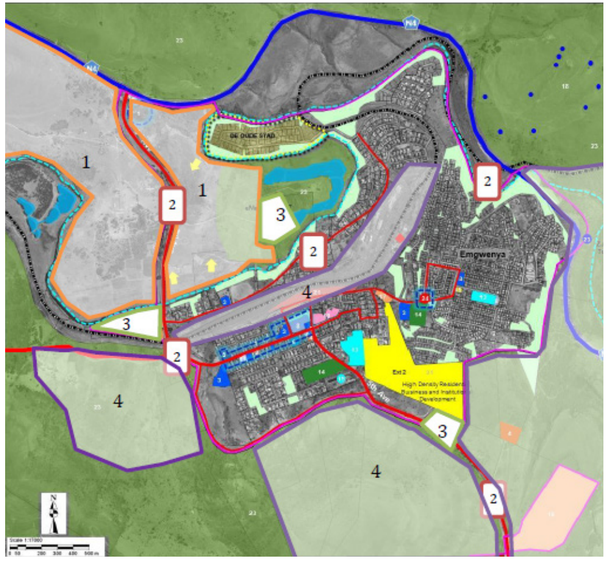
Architectural Issue

Most of the built fabric in the town is of cultural significance due to the values they exhibit aesthetically, technologically, politically and historically.

The buildings and urban spaces are illustrative of patterns of building and place making over various periods beginning in the Iron Ages to the NZASM era, Central South African Railways (hereafter C.S.A.R) period, the South African Railways and Harbours period and finally the present day additions under the democratic government and its industry, Transnet. Most of the larger buildings in the town are threatened due to lack of use and eventual lack of maintenance.

This can be largely ascribed to the lack of appropriate programming of the said buildings and the fact that the buildings aren't suitably adapted for reuse – spatially as well as programmatically. The buildings, and the town at large can be considered as vulnerable to shock – changes that alter the ontology of the town (Peres, 2016) and therefore not resilient. Strategies for the conservation and reuse of these structures remains a priority.



35 **Fig. 35** *Urban renewal proposal for Waterval Boven (WB Noka, 2011)*

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Chapter 3

Regenerating Place - Theory

36 **Fig. 36** *"Building of the tunnel by engineers Warren and Royce had to begin with the breaking off and removal of large rocks. For this exercise, holes had to be drilled into the greenstone of the Elandsberg for the insertion of dynamite. The steam powered aircompressor, an engineering feat of the time, enabled power drilling through the rock. The compressor remained in the town after completion of the tunnel. Parts of the compressor were stolen overtime unitl only the 'romp' remained.Translated account of Fred Geyser (Boven se Storie in Beeld en Woord, 2001)*

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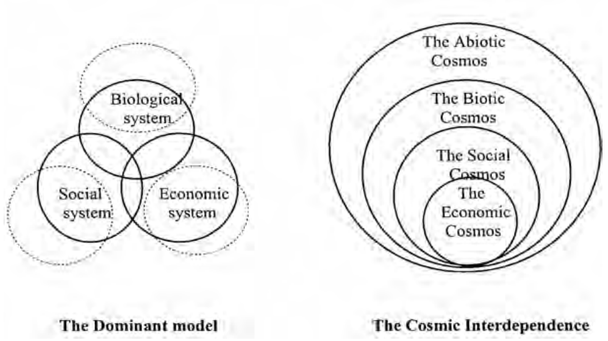

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Fig. 37 *Proponents of sustainable development and others subscribe to what has become known as the "Dominant model" and has been critiqued by more comprehensive model that critically understands the worlds interdependecies. (Östlund, 2017: 124)*
Fig. 38 *The first utterences of sustainability were based on a fantasy of the natural wilderness that proponents felt were being threatened. This still saw nature as something humans consume (Google images, 2018)*

[4] The non-human, in this case, of course relates to the institutions that help sustain the life of the people in the town, inhabitants as well as the visitor. These are the natural resources, the built fabric, public spaces, cultures, institutions etc. all things that would make the town habitable. These institutions could also encompass heritage if not referred to, solely, as such.

Introduction

In the pursuit of an appropriate rejuvenation strategy for the heritage in Waterval Boven, it is essential to begin the process from a world view that considers all aspects of the town: the environmental, economic and social in order to create a sustainable environment for all beings, human and non-human[4], (Ifko, 2016: 2041) that will constitute a habitable and resilient future for the town.

The above is a definition, which the dissertation explores further, is adopted from (Ifko, 2016: 2041)'s definition of *sustainable (re)development,* which serves as a starting point in placing the discourse of a regenerative remodeling strategy within a theoretical continuum. After all, if Waterval Boven is to be read as a cultural landscape then it becomes necessary to recall (Throsby, 2016: 2042)'s reminder that these landscapes are often layered with social, spatial, cultural and technological significances. His assertion is further supported by the BURRA Charter's own definition of what constitutes a cultural landscape via article 15 which describes it as a *"landscape that is culturally significant in its aesthetic, historic, scientific and social values"* (The BURRA Charter, 2013: 12). Thus, (Throsby, 2016: 83) argues for an interdisciplinary approach in tackling these sites and stresses the importance of a context specific heritage management approach towards industrial heritage sites (Throsby, 2016: 83).

Throsby's sustainable (re)development theory model has however been widely criticized for being reductionist in its understanding of the interdependencies of the world and its systems (Östlund, 2017: 124) as seen in fig. (36) and therefore a more expanded world view will have to inform the regenerative remodeling strategy that the dissertation aims to explore. (Moore, 2007: 435), (du Plessis, 2011: 436) and other proponents of the regenerative movement have, over time, proposed the cosmic interdependence model as a step closer toward a more comprehensive understanding of the interdependencies between man and the environment.

The argument for a regenerative remodeling thus stems from a necessity for a context specific heritage approach as prescribed by Throsby's definition above (Throsby, 2016: 84). An approach that acknowledges, through remodeling, the sentimentality of culture and identity of place and embeds this into the sustainable spatial adaptation of the environment in which the place is situated – a regenerative approach that encompasses the whole – human and non-human interrelations in place for a prospective future.

This is the concept the dissertation subscribes to. It is a merger of two theories:

a) the regenerative theory which promotes an eco-systemic thinking approach toward the making of environments, aimed at restoring, renewing and revitalizing inherent resources whilst replenishing the needs of the society (Mang & Reed, 2012: 25) as a whole and
b) heritage remodeling theory which will inform the basis from which the architecture will emerge.

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Regenerative architecture

These theories are, however, not new within the theoretical discourse in architecture. Neither is the merger of these seemingly different but complementing approaches to heritage driven place making. In the spirit of narratives, the evolution of these theories will be discussed through a timeline of the most significant moments through their evolution. It is important to note of course, as (Östlund, 2017: 30) says, that the ontological evolution of theory through various movements is not a denial of the preceding theorem but rather a series of modification of the times" (Östlund, 2017: 30) as is the case with the postulation of this dissertation.

Conservatism and preservationism (1850's +) – man and nature as separate

The case for a regenerative world-view in modern thought finds its roots in the conservationist-preservationist movement of the1850's which was primarily driven by technological and scientific bias towards the efficient management of resources (Östlund, 2017: 32). The preoccupation of these academics was initially built on the tendency toward a conservation on the security of land and its resources for future generations and, later on, during the preservationist moment of this period, there was a shift towards a thinking that emphasized the existential well-being of human-kind to be linked to the way in which we connect to our natural surroundings (Östlund, 2017: 32).

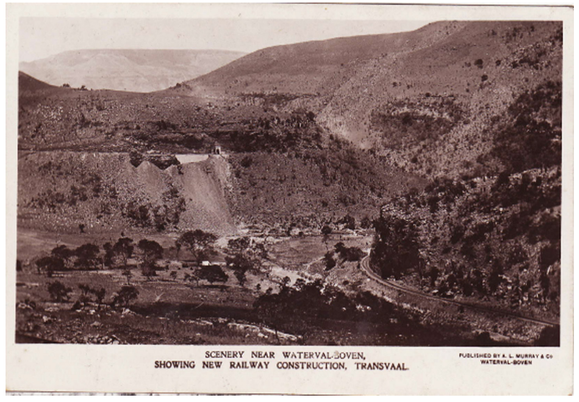

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Fig. 39 *Taming of the African wilderness during the construction of the Eastern line. The NZASM tunnerl can be seen in this image (Boven se Storie in Beeld en Woord, 2001)*

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A new sentiment was rising with regards to the natural beauties and their importance to the well-being of human kind. It was the beginning of a yearning towards a deeper connection with nature, a "wild-premise" that propelled an interest toward the untouched nature (Östlund, 2017: 33).

Environment & Ecologism – man's need to protect nature

The 1950's – 1960's saw a popularisation of this thinking lobbied by activists and a small group of scientists that began to see that the "world is not as divisible" as thought to be by the previous proponents (Östlund, 2017: 34). Due to the newly discovered complexities of the web of life, this period saw the beginning of the expression of this world-view through narrative and storytelling in popular science (Östlund, 2017:35).

An ontological understanding of things began to emerge were the ontology of one thing is not determined by its deference from the other but rather is defined by its functional identity with the other within a particular system. This new perspective prompted a new field of study, the words environmentalism and ecologism emerged from this period (Östlund, 2017).

Sustainability & Sustainable development

The 1970's elicited the shift from ecologism and environmentalism via the resource crises in the oil and energy industry at the time (Östlund, 2017: 37). The term sustainability was used for the first time during this period propelled mostly by the resources industry (Östlund, 2017: 37).

Befitting to one of its legs (economy), this movement is what fuelled the general populous' attention towards the scarcity of world resources and the very urgent need to "reuse, reduce and recycle" (Östlund, 2017: 38).

The theoretical premise behind their preoccupation was the new found synthesised relationship between development and the environment which heightened the factoring-in of environmental concerns with every new development (Kafle, 2011: 187).

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For the first time in the story of this world-view, this thinking had reached political ears so much so that this particular moment enjoyed an illustrious political backing in comparison to the previous periods (Östlund, 2017: 36). Despite its fame and influence, this era was marred by criticisms of having an inability to generate a vision that moves beyond the traditional antagonistic relationship between humanity and the natural environment as observed in this quote of Steven Moore by Östlund (Östlund, 2017: 37):

> "Mainstream sustainability perpetuating a number of dualistic Cartesian ontologies – man vs animal, technology vs nature, urban vs rural, natural landscape vs built landscape."

The main basis of this critique is that this world-view was still very much grounded within an anthropomorphic relationship between man and nature where nature remains a primary resource for the well-being of man-kind (Östlund, 2017: 42).

Ecologism and regeneration

The mandate for this paradigm was not to invalidate the core values of the preceding sustainability movement but rather to incorporate within these values the opportunity for future possibilities, their implications on present day scenarios and the methodologies for getting to that particular future (du Plessis, 2011: 442).

The regenerative design theory's primary occupation is to question the anthropomorphic world-views of the preceding movements into an *"internet of things"* approach where the antagonistic perspective of the sustainability period is replaced with an in-depth approach that explores the interdependent relationships between things in an infinite, regenerative manner (du Plessis, 2011: 443).

A methodology guiding place-making needed to be developed. One that, according to Pamela Mang and Bill Reed (Mang & Reed, 2012: 28) would be based in, on and of place through situated narratives. The main aim of this methodological approach is to bridge the relationship between humans and nonhuman participation in the regeneration of resources for the mutual benefit of the habitat that they co-inhabit (Mang & Reed, 2012: 29).

Fig. 40 *Man and the perception that nature is for his consumption, not participating in the cycle but being an observer of the ecology and a consumer thereof (Author, 2018)*

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The term "regenerate", as Östlund would have it (Östlund, 2017: 42), begins to explain the foundations of this theoretical premise as a response to our relationships between our past, present and future perspectives in any given context. The term suggests, he continues, in essence, a response via (re)creation, (re)production, to bring to the fore what once was through the envisioning of what could be and how this process can be a cyclical one as opposed to the linear one proposed by the sustainability movement (Östlund, 2017: 42). Mang and Reed (Mang & Reed, 2012: 30), important proponents of the regenerative movement describe this methodology for regenerative design in their paper "Designing from place: a regenerative framework and methodology" in fig. 40.

Steven Moore's Non-modern thesis encapsulates these ideas succinctly. In his thesis he observes the dualistic notions of technology versus place (Moore, 2007: 438). He begins his devolution of this notion through defining what he terms "human institutions" as networks that govern identity and social discourse between humans and non-humans in place (Moore, 2007: 438). The preoccupation of his thesis is a symbiotic relationship between technology, ecological practices and the cultural politics of place making (Östlund, 2017: 43).

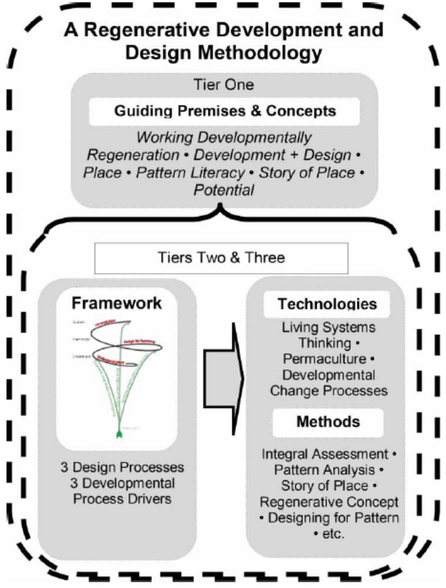

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Fig. 41 *(Mang & Reed, 2012: 31)'s Regenerative development and design methodology.*

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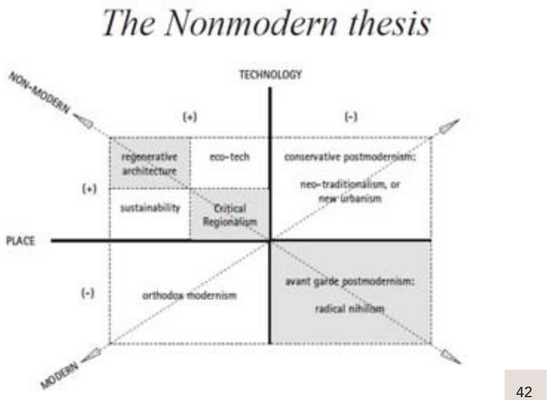

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Fig. 42 *Moore's non-modern thesis evolution diagram (Moore, 2007: 439)*
Fig. 43 *A critique of Moore's diagram by Moore interpreted by the Author, 2018)*

Moore's thesis stresses the importance of biological and political feedback loops in any given ecological system as these inform the multivalent characteristics that constitute the phenomenon of place (Moore, 2007: 439). He uses Agnew's writing to narrow down these characteristics into three main elements to help us define place (Moore, 2007: 439):

a) Location which he defines as the geographic area within which objects or structures of politics and economy are linked together by interest

b) Sense of place a structure of feeling, "character", and representative of the quality of life in space. The human poetics of place. The story of place.

c) Local as the setting in which the social relations are constructed - the town, the city, the public square, the neighbourhood.

These elements are further bound by what physically makes them manifest, technology. Moore goes to the extent of asserting that technology defines who and what we are as society in that technology is a physical, often tangible representation of human knowledge and over time becomes an illustration of patterns of human creativity in the form of physical objects in space (Moore, 2007: 439).

Technology is thus spatial and, like place, its spatiality is related to structures in that it is a relation between object, read artifact, to the natural environment in which it sits as constituted by the human knowledge of that particular place (Moore, 2007: 440).

To extend the spatial understanding of technology, Moore defines it as

"not being a set of objects but rather the social networks that construct relationships between human knowledge, human practices and nonhuman resources… Technology is spatial because its operation depends upon the mobilization of human and nonhuman resources that exist in different places" (Moore, 2007: 440).

He compresses his this into a diagram (fig. 41)

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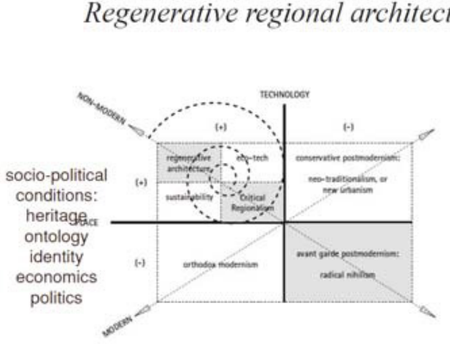

An architecture that seeks to engage human institutions in the democratic reproduction of life-enhancing practices (S. Moore, 2010)

46

He elaborates on this by proposing a reading of technology through geography rather than history as this would enable an understanding of how these "technological networks dominate the places inhabited by humans and non-humans" (Moore, 2007: 441).

Fig. 44 *Technology, Cultural and design as the three legs of heritage and architecture as interpreted by (De Jong, W. & Kuipers, M., 2017. Designing from Heritage: strategies for conservation & conversion. Delft: TUDelft – Heritage and Architecture)*
Fig. 45 *The in between stuff discovered through story of place (Author, 2018)*
Fig. 46 *The regenerative symbiotic relationship between design, cultural value, technology, ecology, society, economy, towards a "working heritage" (Author, 2018)*

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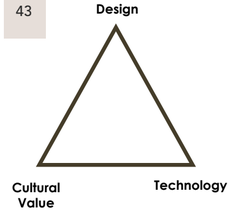

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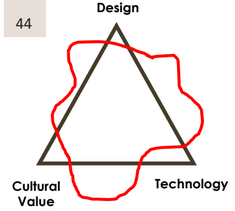

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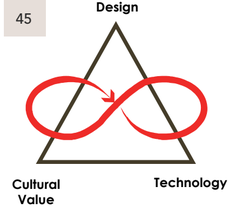

Through the diagram (fig. 42), Moore criticizes modernity saying that humans have never in practice been modern because modernity presupposes a separation between object (item of technology) and subject, and human and non-human (Moore, 2007: 442).

His thesis proposes an erosion of the modern Cartesian plane that distinguishes humans from non-humans (Moore, 2007: 442).

The non-modern thesis subscribes to a regenerative architecture which is defined by landscape architect John Lyle as a system that "provides for the continuous replacement, through its own functional processes, of the energy and materials used in its operation" and thus the thesis commands an architecture that actively participates in the energy flow of this system (Moore, 2007: 442).

He concludes the thesis in the form of a manifesto that defines

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A regenerative architecture that (Moore, 2007: 442):

1. Will construct social settings that can be lived differently
2. Will participate in the tectonic history of place
3. Will participate in the construction of cultural and ecological processes
4. A regenerative architecture will resist the centres of calculation by magnifying local labour and ecological variables.
5. Will construct the technologies of everyday life through democratic means.
6. The technological interventions of regenerative architecture will contribute to the normalization of critical practices.
7. The practice of regenerative architecture will enable places by fostering convergent human agreements.
8. A regenerative architecture will prefer the development of life-enhancing practices to the creation of critical and historically instructive places.

It is at the last point where Moore speaks to historicity in the making of place where the dissertation finds an intersection between Moore's non-modern thesis and remodeling theory. In order for one not to simply recreate or emulate the past, a critical understanding of that past in necessary to guide the what moves into the future from story of place.

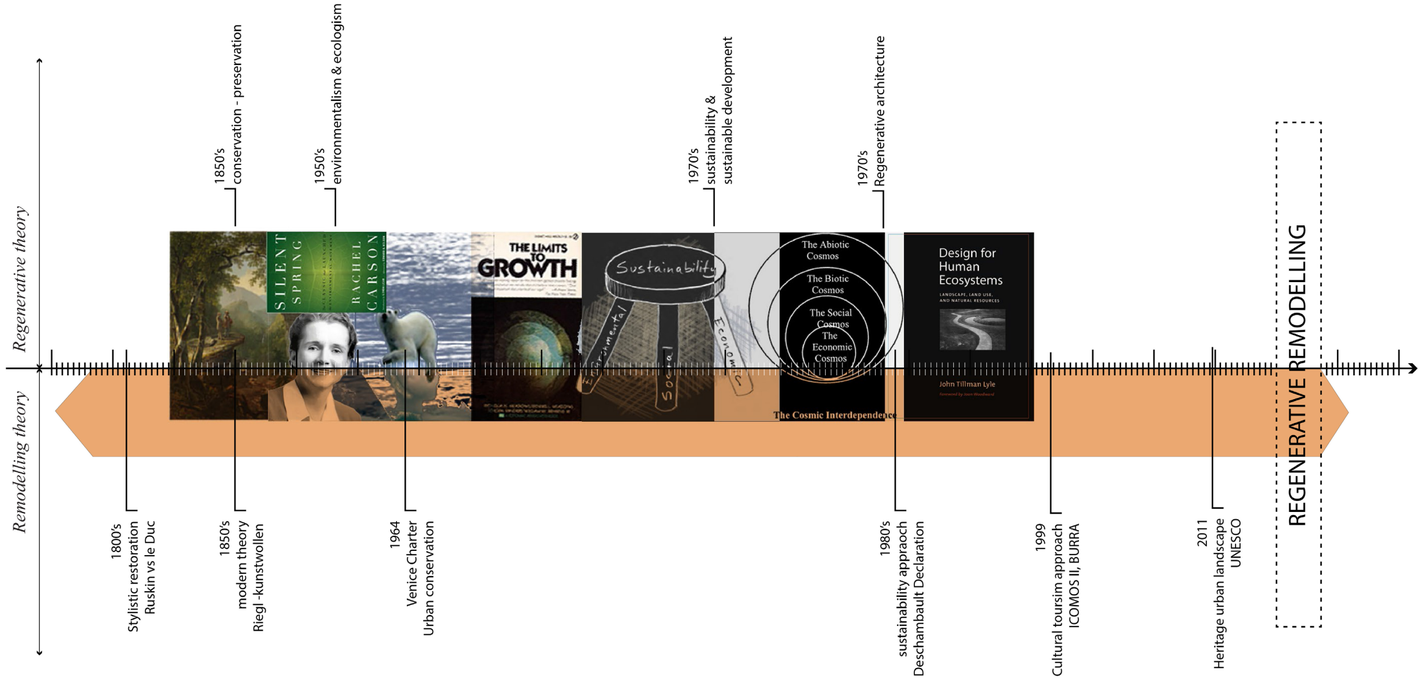

Fig. 47 *The historic evolution of regenerative architecture (above the line) and below the line is the historic theoretical development of heritage charters, concurrent development of the two theories. The dissertations postulation is the confluence of the theories. (Author, 2018)*

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Remodelling

"A town without old buildings is like a man suffering from the loss of memory" – Ravel Fox (Fox, 1972: 17)

Revel Fox, in the above statement, was making reference to the importance of history and historicity of any given place in the definition of its identity and thence story of place. In his paper titled Conservation in Cities, Fox urges the necessity of effective conservation of historic towns and cities stating that the conservation of these places should be geared towards redevelopment and revitalisation rather than preservation and museumification (Fox, 1972: 17).

Fox made these remarks at the dawn of the post-World War II debate around heritage and preservation in the global West where before the war, the preservation-conservation debate was centred on the protection of

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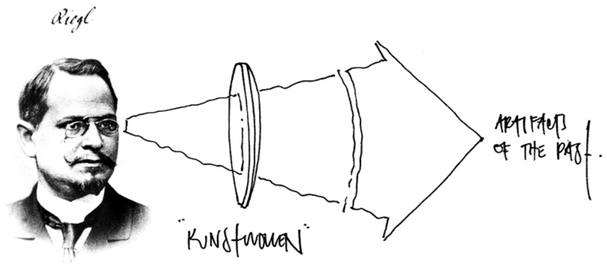
singular large public buildings (the Netherlands Cultural Heritage Agency, 2014: 43). After the war, the incorporation of whole areas around those particular monuments came into question due the devastating effects of the post-war reconstruction period in Europe where a large amount of historic centres were destroyed by Modernist driven development which preferred new languages of building that contradicted the historic fabric (the Netherlands Cultural Heritage Agency, 2014: 43). Changes in societal values and perception towards sentimental histories also came into question during this period.

Theoreticians such as Alois Reigl questioned the valuation system of what constitutes a cultural landscape through his "kunstwollen" thesis which accentuated the importance of authenticity from building to whole areas (Zeayter & Mansour, 2017: 6). His thesis expanded on modern society's concepts and values in relation to conservation via two main groups: memorial values - pertaining to the age, the historic and the intended memorial value and present day values – prompting use, art newness and relative art value (Zeayter & Mansour, 2017:7).

This prompted, according to Paul Meurs, the ground breaking publications such as Kevin Lynch's Image of the city (1960); Jane Jacob's The death and life of the Great American cities (1961); Aldo Rossi's The Architecture of the city, among others, which became important voices for a city based on the human beings and the human scale (the Netherlands Cultural Heritage Agency, 2014: 45).

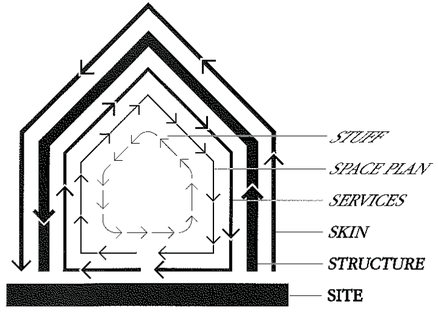
The ideas of city and historicity presented by these publications introduced a new paradigm in heritage and conservation wherein the historic city and later historic ensembles that contributed to the character of the place could be interpreted as historic and therefore of heritage value (the Netherlands Cultural Heritage Agency, 2014: 46).



48 **Fig. 48** *Reigl's Kunstwollen lens toward viewing an artefact of historic value (De Jong, W. & Kuipers, M., 2017.)*

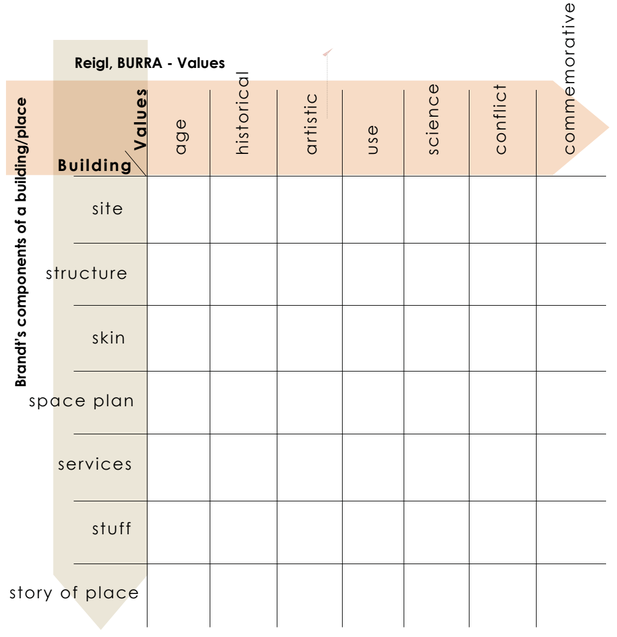
This meant that aspects such as the morphological structure of the historic centre, relationships between public and private spaces, the cities social fabric, local communities and the possibilities could form part of the valuation process of the historic area (the Netherlands Cultural Heritage Agency, 2014: 47).

This new understanding enabled, in the 1970's, the incorporation of whole cities, monumental ensembles and even structures into heritage conservation policies such as the 1964 Venice Charter among others (Zeayter & Mansour, 2017) (the Netherlands Cultural Heritage Agency, 2014) The latest development in the conservation debate is the move from an urban structural understanding of the historical place to that of the urban cultural landscape (the Netherlands Cultural Heritage Agency, 2014).



49 **Fig. 49** *Brand's shearing layers of a building (Brand, 1994)*

Meurs describes this development as one that shifts the emphasis from morphological structure of the historic place to the landscape substratum where the past and present of place intersect at levels higher than that of objects and structures (the Netherlands Cultural Heritage Agency, 2014). It is the place where the boundaries between heritage zones and developmental zones are blurred.



50 **Fig. 50** *Brand's shearing layers of a building (Brand, 1994)*

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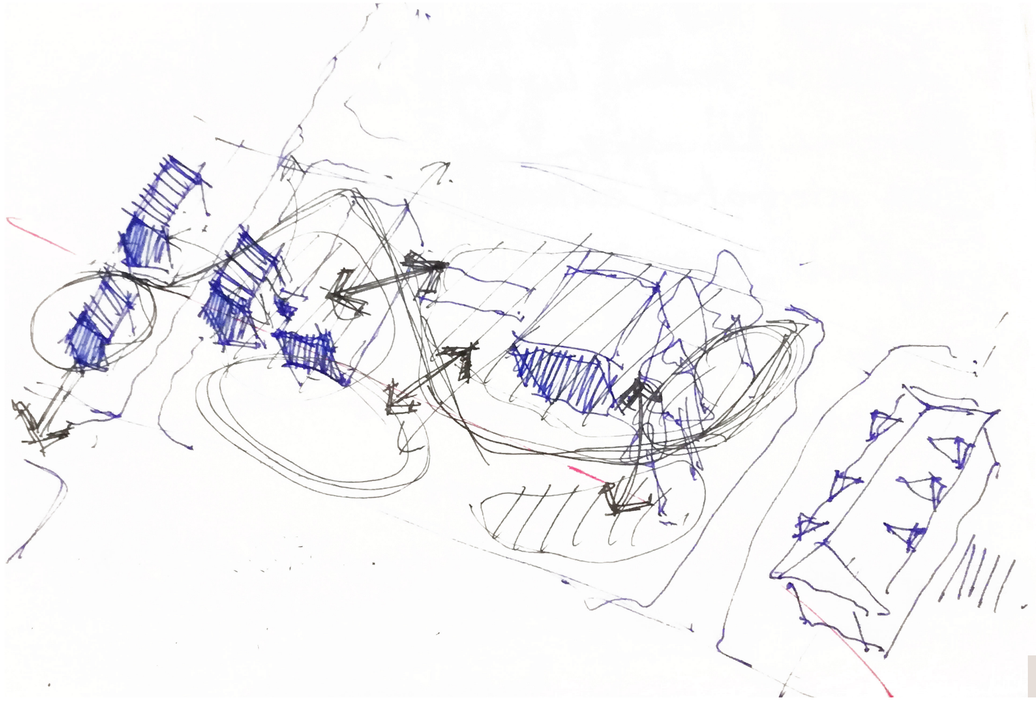
This shift was incited by the World Heritage Convention's declaration of what it termed the "Outstanding Universal Value" concept that was aimed at protecting heritage(s) that is perceived to be of "such importance and outstanding value to all humanity" (Zeayter & Mansour, 2017). Meurs projects an area specific approach which would be based on the cultural (physical and meta-physical) values of place as guidance to identify opportunities for the constructive conservation that Revel Fox (Fox, 1972) referred to a few decades earlier in our own context.

Revel Fox devolved his thinking of urban conservation into three main themes that would make constructive conservation plausible (Fox, 1972):

1. Conservation is effective when considered in terms of whole areas and environments
2. In urban areas, conservation is only feasible when considered as an integral part of urban planning and
3. Conservation is likely to be effective only when considered as strategy for revitalisation.

A crucial concept emerges from his paper: a strategy that merges urban planning and conservation with the intention for long term effectiveness through rejuvenation.

Corten and Geurts echo this call some five decades later with the Dutch strategy of integrated conservation wherein the two argue



51 **Fig. 51** *Brand's shearing layers of a building (Brand, 1994)*

for the culmination of conservation and urban planning. They refer to this point of intersection as urban management (the Netherlands Cultural Heritage Agency, 2014).

The strategy critiques the approach towards heritage as victim which was the approach by the founding fathers of conservation-preservation – John Ruskin and Violet le-Duc- to one of heritage as an asset (the Netherlands Cultural Heritage Agency, 2014). In the former approach the arguments were based on the maintenance of the cultural values of the monument. The monument is seen as vulnerable and in need of constant nurturing and protection by external caretakers, often read as the state (the Netherlands Cultural Heritage Agency, 2014) which come in the form of protection by way of charters like ICOMOS and the BURRA charter.

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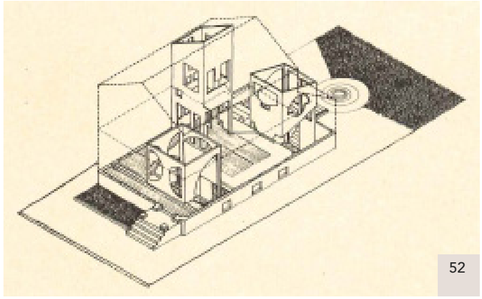
The latter alternative approach, Corten and Geurts (the Netherlands Cultural Heritage Agency, 2014) recall, was first formulated in the Declaration of Amsterdam in 1975 and has since seen development through the Washington Charter (1987) and most recently UNESCO's redefinition of the historic urban landscape as quoted by the (the Netherlands Cultural Heritage Agency, 2014):

"…a mind-set, an understanding of the city, or parts of the city, as an outcome of natural, cultural and socio-economic processes that construct its spatiality, temporally and experientially. It is as much about buildings and spaces as it is about rituals and values that people bring into the city. This concept encompasses layers of symbolic significance, intangible heritage, perception of values, and interconnections between the composite elements of the historic urban landscape, as well as local knowledge including building practices and management of natural resources."

The quote evidently suggests the dynamic and adaptable nature of the historic urban landscape and the need for approaches that perceive it as such as opposed to those that perceive it as static objects trapped in time. This conclusion begs the question of how does this approach look like architecturally?



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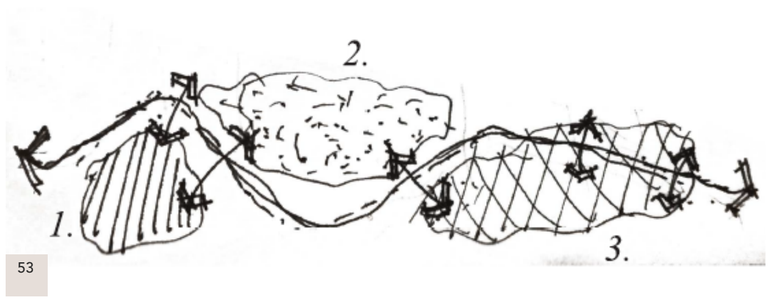

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Fig. 52 *Charles Moore, Moore House, New Haven, Conn., 1967. Example of palimpsestual remodelling (Machado, 1976: 48)*
Fig. 53 *Regenerative remodelling conceptual intention: (1) Architecturize the ontology of Industry (2) Merge the monument into the everyday (3)Celebration of the production of memory*

Rudolfo Machado proposes a way of thinking with regards to re-scripting place. Machado begins his proposal through a critique on terms such as "architectural recycling", "environmental retrieval", "adaptive reuse" and even "retro-fitting" as empty euphemisms that negate the complexity of the task accorded to the remodeller (Machado, 1976: 46).

In fact, Machado outright rejects these terms as he believes they are not representative of the change in conceptual thinking with regard to the previous as well as existing condition of the object of remodeling (Machado, 1976: 46). Instead Machado and contemporary heritage architects insist on the term "remodeling" when working with heritage fabric as this terms meaning "clearly includes the concept of formal intervention on existing form" (Machado, 1976: 47) (Roos, 2007: 16).

Both authors propose the reading of building as palimpsest (Machado, 1976: 47), in other words, the building contains its own story, within a framework of time, which is related to its own past, physically, but also its relationship to its context, metaphysically (Roos, 2007: 16).

Steward Brand's shearing layers (fig. 48) of change best illustrates this concept wherein he describes the varying rates of change between the six components of a building (Brand, 1994: 13). His illustration communicates the concept that a building consists of slow changing elements (site, structure, skin) which relate to context and identity and place and then fast changing elements (services, space plan, stuff) which engage the user of the building directly (Brand, 1994: 13).

In a sustainable heritage approach of the 1980's (Zeayter & Mansour, 2017: 9), the concern of the remodeller would only be with regards to the fast changing elements of a building. Almost negating Reigel's Kunstwollen of the present day context with the ambition of preserving as much of the heritage fabric as possible. To the regenerative remodeller however, the concern is to temper with time through a formal intervention as prescribed by Machado and Roos (Machado, 1976: 14) (Roos, 2007: 17) by formulating a concept of the new from a comprehension of the story of place. For the regenerative remodellor the regenerative potentials lie within the realm of the slow changing elements of a building.

Regenerative remodelling

Regenerative remodeling is the strategy that the dissertation will use to investigate the historic cultural landscape in a manner that emerges from place; finds inspiration through the existing and can project the quality of the existing into the future without threatening the authenticity of place and the livelihood of the humans and non-humans in place. The hypothesis is a merger of regenerative design theory and remodeling theory.

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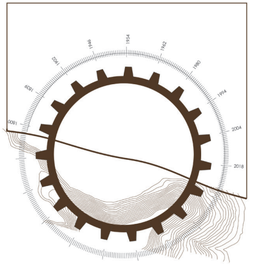
Technology as time

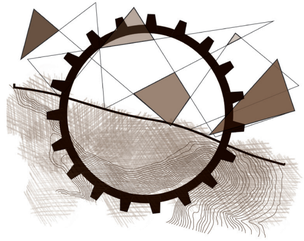


In the reading of place one can make differentials between the history of place and the memory of place where the history is the representation of a reconstructed past based on temporal continuities, memory is borne by living beings and objects in space. Memory remains in a permanent state of evolution (Nora, 1989). Memory, manifest itself as technology. It is bound to space and place over time. Thus technology is seen as the marker of human activity in space. A time marker.

Technology as human institutions

Technology as human institutions – Memory, unlike history, creates bonds between the past and the eternal present (Nora, 1989). Objects and their associated landscapes age, rust, decay and get reconstructed in different but similar forms. They are projections of past identities into the present to facilitate future activities. They are permaculture, knowledge exchanges, gestures, images etc. housed in the technological object or landscape. They describe who and what we are (Moore, 2007). Technology is culture.

Technology as industry



Technology as industry – Industry is described as the network that houses the human institutions. They are the exchanges of knowledge that is required to solve problems, to innovate and to consume. Industry is the confluence between human knowledge, human practices and non-human resources (Moore, 2007).

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54 **Fig. 54** *Ways of reading memory of place as concluded from Moore's non-modern thesis. These lenses were applied as a means to read story of place for the making of a contextually relevant story of place for Waterval Boven*

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Chapter 4

Story of Place - Context

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Fig. 55 *As construction of the railway progressed westwards, so began the two end points of the rack-rail tracks with Waterval Boven on upperside of the escarpment. Visible in this photo is the original station building recognisable by its double storey, metal clad observation tower. The original building still forms part of the existing station building. The other buildings in this picture have all dissappeared. The twin watertanks were filled with water from a nearby fountain on the Southern hills. For steam locomotives, water and coal were an absolute necessity"- translated account from (Boven se Storie in Beeld en Woord, 2001). The gangers cottage (second building from the right) is still in existence*

4.1 Writing the Story of Place

In a South African context, part of the issues making heritage management an ailing project is the issue of the controversial political history behind the given heritage (Mnyaka & Minkley, 2015), often rendering the inclusion of said heritages into planning processes difficult. Goudswald, Bos, van Roode and Pape provide us with a methodology for making heritage relatable and thus usable in their thesis Reverse Heritage: in search of a usable past (Goudswaard, et al., 2012: 138).

In their thesis, Goudswaard, et al. critique current practice of heritage management in the Netherlands but more so in most countries outside the Netherlands. In their critique they highlight that traditional ways of conservation are usually aimed at embedding heritage in the planning process with the objective of the product being the heritage itself – to be consumed by academics and tourists (Goudswaard, et al., 2012, p. 139). The authors argue that Reverse heritage would offerers the added dimension of usability through the addition of the end-users voice in determining that which is valuable with regards to that particular heritage (Goudswaard, et al., 2012: 141)

Goudswaard thesis finds expression through a card game invented by the authors wherein the stakeholders involved in the heritage conservation project would participate in determining the value of the heritage, the ambitions of the project and eventually its future perspectives (The Missing Link, 2011: online) linking us well into the making of story of place as explored in the theoretical exploration. The game works as follows:

Step 1: Creating the story line from a local identity

An inventory and analysis of place is conducted by the professional consultants to determine the identity and ontology of place and this would serve as a basis for a usable narrative that present day users can relate to. (The Missing Link, 2011: online)

Step 2: Creation of the story line

The results from the inventory are presented to the stakeholders from which they, with the facilitation from professionals, places value onto said narrative and simultaneously adds their (the stakeholders) respective ambitions for the given place (The Missing Link, 2011: online).

Step 3: Translating the ambitions into a local brand.

The narrative that results from collaboration in step 2 is then translated into and expressed as recognisable branding, marketing and planning for the location in the form, for example, of an experience plan, urban design plans and other means to plan for an in situ rejuvenation strategy (The Missing Link, 2011: online).

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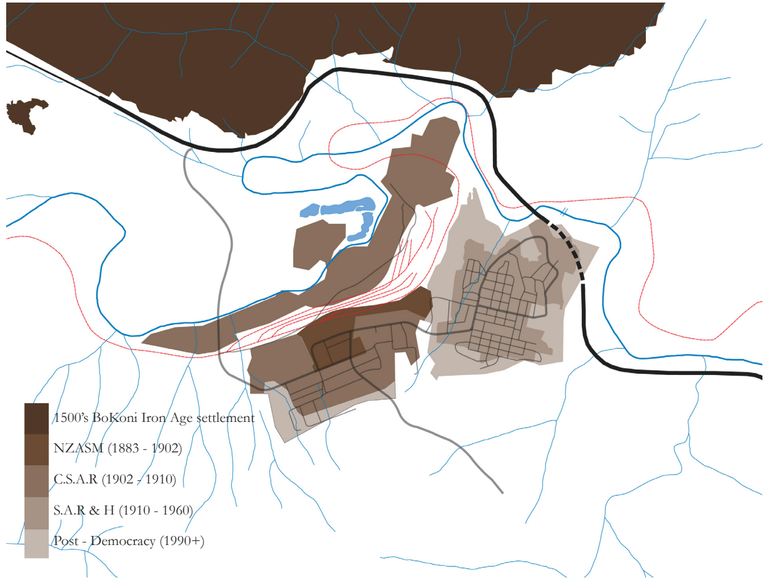
4.2 Step 1: The story of Waterval Boven

Established in the late 1800's as a supply depot for the Nederlandsch-Zuid-Afrikaansche Spoorwegmaatschappij (hereafter NZASM)'s Eastern line trajectory (Clarke, et al., 2016: 21) Waterval Boven holds a significant position in the narrative of the 'Transvaal period' history of South Africa.

The town's story can be divided in to five periods of constant occupation beginning in the 1500's Iron Ages already. This section will give a brief history of the town through the various periods of occupation. Each period will be concluded with how it impacted the landscape (ways of inhabitting the landscape.



56 **Fig. 56** *Timeline of illustrating the development of Waterval Boven (continuous habitation) over time. (Author, 2018)*

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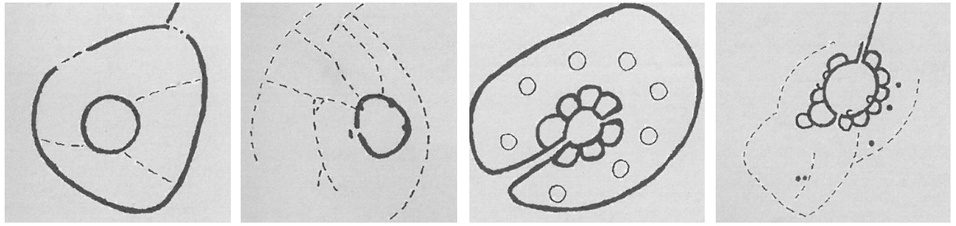

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Fig. 57 *Bokoni settlement typology (Delius, et. al, 2016: 31)*

4.2.1 The continuum – occupation of Waterval Boven

On the Northern escarpment from Waterval Boven are stone walls traversing some 10 000 square kilometres across the hills and valleys of the Carolina region. These were, according to archaeologists Dr. Schoeman et al, the stone walled settlement built by the Bakoni tribe which controlled the region between the 1500's up to the 1830's (Delius, et al., 2016: 32).

As was the case in the latter 1800's, the settlement lay along a trade route, in the form of the Crocodile and Komati rivers linking various villages in the region to trade partners in Zimbabwe and Mozambique (Delius, et al., 2016: 32).

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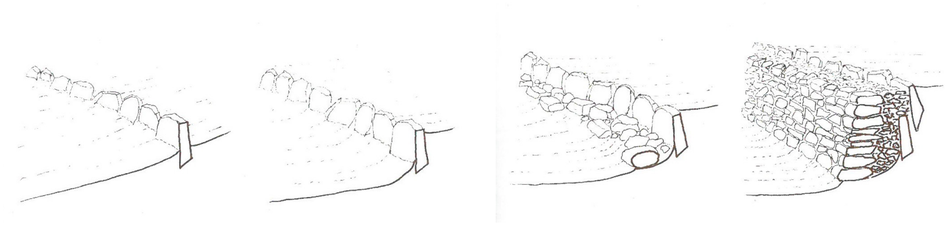

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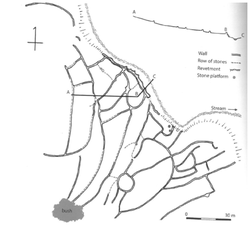

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Fig. 58 *Terrace agriculture technology (Delius, et. al, 2016: 33)*
Fig. 59 *Typical settlement pattern, plan (Delius, et. al, 2016: 36)*

The settlement pattern of these settlements had a topographical bias. Studies have revealed that unlike the preceding farming societies in the region and elsewhere in the country, the Bakoni were inventive with their way of living, a-typifying the common pre-colonial settlement patterns of the time (Delius, et al., 2016: 33)

The Bakoni's typology was a result of the site of the Bokoni settlement which is in the middleveld of South Africa meaning that unlike their Highveld counterparts, they did not have the privilege fertile soil and warm climate as the temperature in this region is much cooler and the soils too acidic for crop cultivation – the topography had to be modified to accommodate the farming community (Delius, et al., 2016: 33).

This topographical and climatic restriction extended to the availability of building materials – grasslands make for bad forestation conditions therefore the Bokoni had to replace traditional timber methods of construction with a more readily available raw material - stone (Delius, et al., 2016: 34)

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The Koni peoples manipulated the hill slopes and river banks by building terraced walls. The purpose of the walls was to slow down runoff of rainwater and to reduce soil erosion meaning that with a slower runoff, one increases the percolation of water and nutrients in the soil and thereby increase almost fourfold the capacity for sustainable agriculture on the hill slopes (Delius, et al., 2016: 38)

Fig. 60 *Aerial view of Stone circles (Delius, et al., 2016)*
Fig. 61 *Terraces of the Koni settlement (Delius, et al., 2016)*

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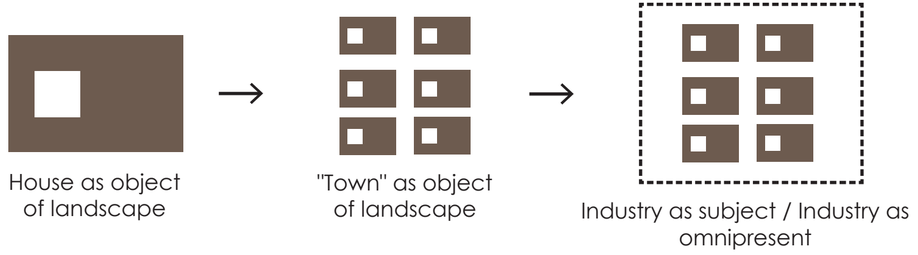

62 **Fig. 62** *Iron Age, BoKoni period relationship of architecture, landscape and industry (Author, 2018)*

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4.2.2 NZASM and innovation – inception

Background

The origins of Waterval Boven as a town, in the contemporary sense of the word, begins in the late 1800's Transvaal era within the history of South Africa when the Volksraad of the ZAR desired a rail connection to the coast of Lorenzo Marquess, today Maputo in order to intensify the booming mining activity (Clarke, et al., 2016: 22).

After failure to establish the connection in the 1870's due to political pressures from the British colonial government, plans and town layouts were finally generated following the independence of the ZAR in 1881 (Clarke, et al., 2016: 22) The discovery of gold and other minerals in the Witwatersrand in 1886 prompted an urgency to the development of a railways connection to the coasts, including the British controlled Natal and Durban harbours, in order to service the mines but also to improve international travel into and out of the Transvaal (Clarke, et al., 2016: 24).

In 1887 the Nederlandsche Zuid Afrikaanse Spoorweg Maatschappij (NZASM) was established as the company that would take charge of the construction and operations of the railways enterprise in the ZAR (Clarke, et al., 2016: 25). The company achieved the goal of an infrastructural upgrade through the construction of six main lines that all culminated at the heart of the then Transvaal province, the city of Johannesburg. Construction began with the Rand Tram line connecting Johannesburg to Boksburg in 1890 which was later extended to Springs and Krugersdorp (Clarke, et al., 2016: 26).

Fig. 63 *Image of the original town plan for Waterval Boven done under the auspices of President Paul Kruger (Photographed by Author, 2018)*

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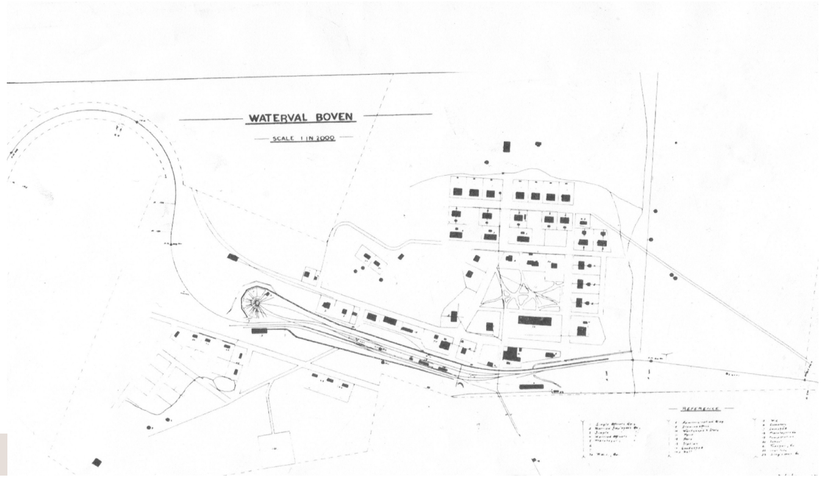
This was followed, in 1892, by the Southern line connecting Johannesburg and the Cape colony via the Orange Free State and the South Eastern line connection to the Natal border was completed in 1896 (Clarke, et al., 2016: 28). The jewel of this enterprise was the Eastern line, connecting the Transvaal to the Portuguese controlled border of Mozambique in 1894. The Eastern line would be the longest and most important of the six lines by value of built structures and whole settlements as well as freedom from political control from the British (De Jong, et al., 1988).

In the thirteen years of operations in the ZAR, the NZASM enterprise boasted six railway trajectory lines and approximately 362 known structures including houses, cottages, culverts, bridges and other artefacts like water towers and water tanks. (Clarke, et al., 2016: 28)



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Waterval Boven sits in the dead centre of the Eastern line and like many of the railways towns in the region, Waterval Boven too was a designated service depot for trains and goods traversing the Eastern trajectory (Clarke, et al., 2016: 29). The town's centrality on the Eastern line afforded it an ontology beyond the servicing of cargo into a political centre as this was, after all, the first encounter with the Tranvaal as an outsider, and your last sense of civitas as an expat leaving the country. The town became a gateway into the Zuid Afrikaanse Republiek (ZAR) (De Jong, et al., 1988).

Fig. 64 *Map of Waterval Boven as drawn by the Imperial Military Railways (IMR) after the cession of the NZASM. (De Jong, et al., 1988)*

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Town plan

The layout and design of the town was conducted by the NZASM drawing office in Pretoria under leadership of architect VAHC van Lissa, W Verweij and C van der Made, graduates from Delft Polytechnic whose residence and training in the city of Delft would later influence their work in the ZAR (Clarke, et al., 2016: 29). The original design of Waterval Boven has been likened and even linked to Agneta Park - an industrial housing town in Delft, similar to Waterval Boven, by historians (Clarke, et al., 2016: 29).

The design of Agneta Park, like many a new industrial town being designed at the time, was driven by a necessity to create an environment that would contrast the congested and unhealthy urban areas of the Netherlands typically inhabited by workers, these architects, as seen later on in the publication of "Garden cities of tomorrow" were preoccupied by the wellbeing of the workers (Clarke, 2014: 164). Agneta Park would house the workers in a garden city "outside" the historic city of Delft in type houses, some stand alone and others row houses with each house being adorned with a hedged front garden (Clarke, 2014: 164). These elements of the town would be assembled inside an English style landscape park (Clarke, 2014: 164).

The ideologies of the garden city, as witnessed in Agneta Park, as well as the Boer town typology of building around a square find confluence in Waterval Boven. The town was laid out on the slope to the south of the station, allowing the station and thus the industry (the reason for the town's existence) to be in constant view from anywhere in the town (Clarke, 2014: 165).

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Fig. 65 *Town plan of Agneta Park in Delft (Clarke, 2014: 165)*

The layout of the cottages followed a rigid grid which was adjusted to suit topography, a slight deviation to the Agneta Park model, but these too would be built around an urban commons, a park containing opportunities for recreation and leisure, emulating the function of the ponds in Agneta Park (Clarke, 2014: 165).

The park, unlike the squares of the *boere dorp*, did not accommodate religious buildings or commercial activities, these were accommodated among the streets surrounding the park freeing the park for recreational use (Clarke, 2014: 166)

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Type housing

The rapid growth of the mining industry along with limited funds at the disposal of the company pressured the architects to build good and fast for the accommodation of NZASM staff in its service centres (Barker, 2014: 111). This meant that the NZASM drawing office had to develop type plans modelled on replicability and incremental growth (Barker, 2014: 115).

The architects and engineers of the NZASM office had plenty a precedent to follow in the development of such a solution: firstly, strategies for standardisation and rapid implementation had been developed by the Dutch in Indonesia by the *Naamlooze Venootschap Nederlandsch Indische Spoorweg Maatschappij (NISM)* by 1867 already (Barker, 2014: 115) and secondly the Cape and Natal government built housing types for railways and mining housing (Wasserfall, 1989: 225) both served as adequate templates to build upon.

The development and application of the type was also dictated by location (Barker, 2014: 115). The high-, middle- and lowveld climate of Eastern line was, the architects would learn after years of surveys, eerily similar to that in Indonesia making the importing of the NISM's standards an almost obvious lesson (Barker, 2014: 115).

In Waterval Boven, located in the middleveld of the Eastern line, the use of stone (due to availability), ventilated roofs and raised floors were introduced to deal with the climatic conditions of the region (Barker, 2014: 115).

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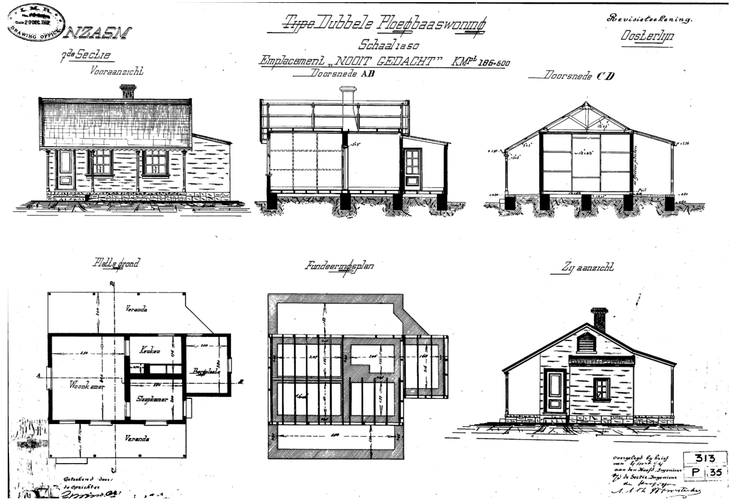
Fig. 66 *An example of semi-detached house typology converted into a single family bungalow (Author, 2018)*
Fig. 67 *Example of a semi-detached dwelling converted into two single family units. Here the relationship between the street, yard and house is exemplified. (Author, 2018)*

68 **Fig. 68** *Plan and elevation of Station Masters cottage. This cottage is still in existence in the town. (Wasserfall, 1989: 224)*



69 **Fig. 69** *Example of a double ganger's cottage (NZASM Archive, ZuidAfrika huis, Amsterdam)*

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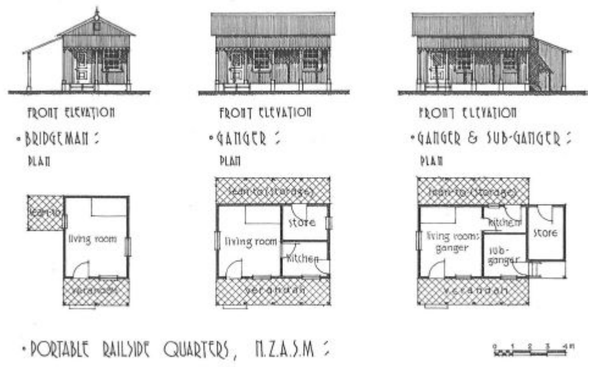

70 **Fig. 70** *Portable railside quarters by the NZASM drawing office. Originally in steel and timber but later built in stone in unforgiving climate of high and middleveld of the Transvaal. Typology built on expandibility is evident here. (Wasserfall, 1989)*

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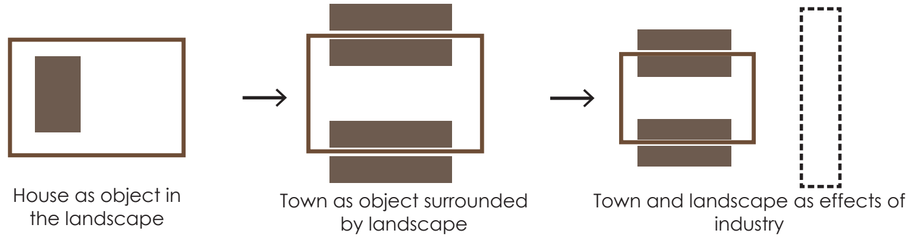

71 **Fig. 71** *NZASM period relationship of architecture, landscape and industry (Author, 2018)*

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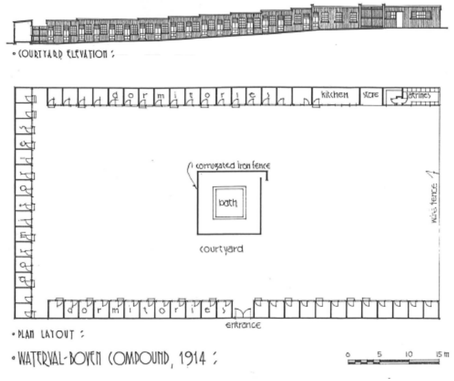
4.2.3 IMR / C.S.A.R

After President Kruger and the Boere were defeated in the Anglo-Boer war, the NZASM enterprise was halted in its tracks, disbanded and eventually dismantled.

The built infrastructure, including the train stations, bridges and entire towns, all the asserts owned by the company were seized and taken over by the British military (Barker, 2014: 125) and placed under the control of the Imperial Military Railways (IMR), a company set up by the British government to administer all seized projects of the Transvaal Republiek. The IMR (later the Central South African Railways, C.S.A.R after British government consolidates all railways companies operating outside the Cape and Natal) continue the NZASM Flemmish revival, chalet idiom of architecture (Barker, 2014: 125) (Wasserfall, 1989: 226).

With the IMR in control, the expansion of the town saw closer links to houses of miners and railways workers in the Cape, Natal and Johannesburg (Wasserfall, 1989). This period is the emergence of a of the red-brick industrial typology of mining towns and hostels within Waterval Boven.



72 **Fig. 72** *Wood-and-iron railway compound in Waterval Boven, c. 1914, has since been demolished (Wasserfall, 1989: 181)*

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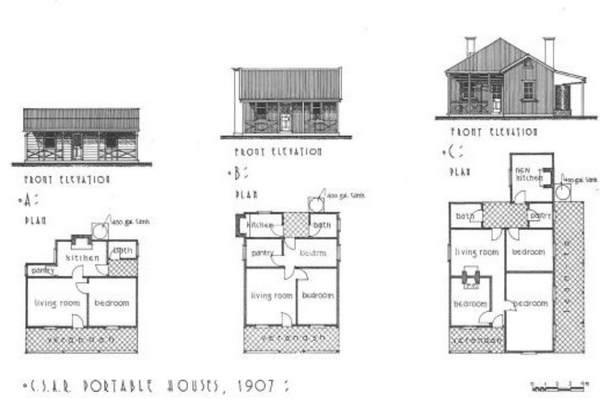

73 **Fig. 73** *C.S.A.R portable houses (Wasserfall, 1989)*

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74 **Fig. 74** *C.S.A.R period relationship of architecture, landscape and industry (Author, 2018)*

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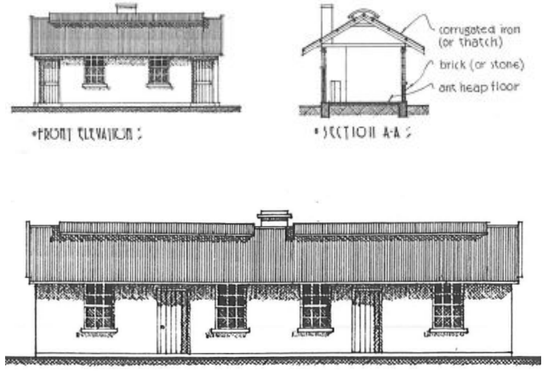
4.2.4 South African Railways & Harbours (S.A.R & H)

After the union of the British and Afrikaans governments, a need emerged to consolidate state resources yet again, this time, the railways companies of the then four provinces, the Cape colony, Natal province, the Orange Free State and the Transvaal, were to be merged into one umbrella - company named the South African Railways and Harbours (SAR & H).

New resources and funds as well as technology propelled radical developments to the South African railways industry which at times was to the detriment of places and artefacts of the preceding periods. By this time, some of the Dutch built tracks which meandered along topography were straightened or realigned to shorten the journey on the rail.

New technologies such as the use of new excavation techniques and bigger railway sleepers made it easier and cheaper to traverse the difficult topography of the then Transvaal. Whilst the new development meant an improved and more efficient railways system, it also came at the detrimental price of supressing what would be former service centres. The straighter, stronger lines thus by-passed entire towns and consequently shattered their bases of existence. Despite the changes to industry like the realignment of the trajectory, Waterval Boven remains in use as a service depot to this day albeit a less significant service centre to the trains.



75 **Fig. 75** *Type married quaters - Semi detached (Wasserfall, 1989: 192)*

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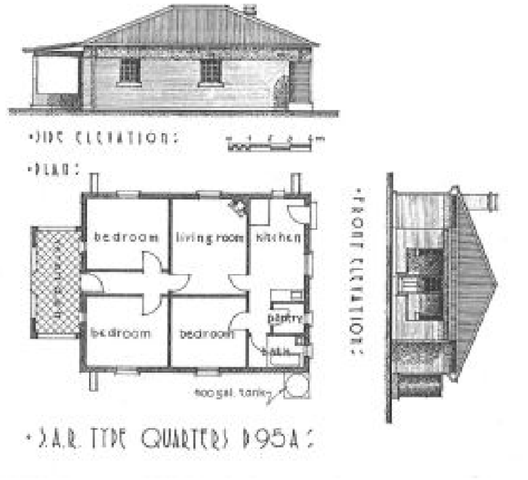
Another example of change was the automation and electrification of the railways industry which changed the workforce of the town. Less staff was needed by the South African Railways and Harbours and thus less people were employed and certain engineering and technical services could be performed remotely. These changes were not all negative however. Bigger and faster trains meant more goods could be transported which meant an increase in the labour forces in the mines. Coal mines in Mpumalanga specifically, replaced the blue collar railway workers in these towns with miners and along with this new work force came a new architectural typology in Waterval Boven.

The introduction of the mining housing typology (hostels) made its way into the town and for the first time, under new political rules, the segregation in terms of settlement on the basis of race emerged. This of course was in alignment with the politics of Apartheid which resulted in the emergence of the township for the first time.

The town's societal landscape shifted from cosmopolitan to that of separation. Not much strides are made in the making of place through nature but nature as resource changes the towns economy and politics. Nature is also used as a means to segregate racially and feudally.



76 **Fig. 76** *S.A.R Type Quarters P95A c.1930 (Wasserfall, 1989: 249)*

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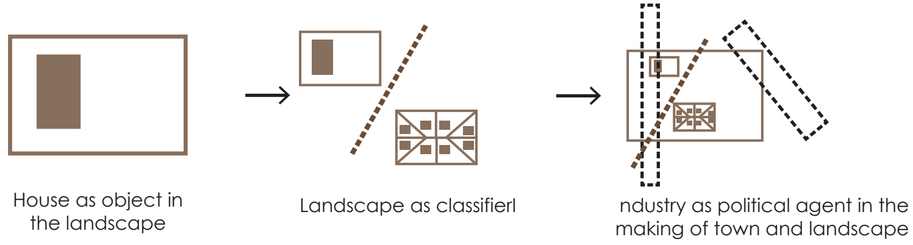

77 **Fig. 77** *S.AR&H period relationship of architecture, landscape and industry (Author, 2018)*

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4.2.5 Transnet's Waterval Boven

In the 1990's the South African government decided that state owned enterprises sell off property deemed "excessive". Most residential buildings in the town with exception to the "gangers cottage" were sold off to private investors. Maintenance and conservation efforts consequently fell into the hands of private investment. Industry in the town changed from that of rail to Eco-tourism. Waterval Bovevn's regional ontology declined from a major national railways service centre to a 3rd order service town offering municipal services to neighbouring towns and townships. This service too declined over time when most of the regional municipal offices were relocated to Nelspruit.

The architectural influence during this period came in the form of a change in materials and typology. A roll out of a new form of government funded type housing was built in the township to mitigate the housing shortfall caused by the rising population in the township.

On an urban scale, investment efforts shifted away from the historic institutional core which was designed around the landscape to present day First Street. The notions of landscape and wellbeing become less important in the developments of the town in this period. This is evident in the proposals made by the government for the towns redevelopment.

Despite the gradual disconnect between industry, place and landscape, the landscape remains a main source of income through subsistence farming; recreation and beautification for the majority of the town and township community.

78 **Fig. 78** *Example of Reconstruction and Development Programme (RDP) (Author, 2018)*

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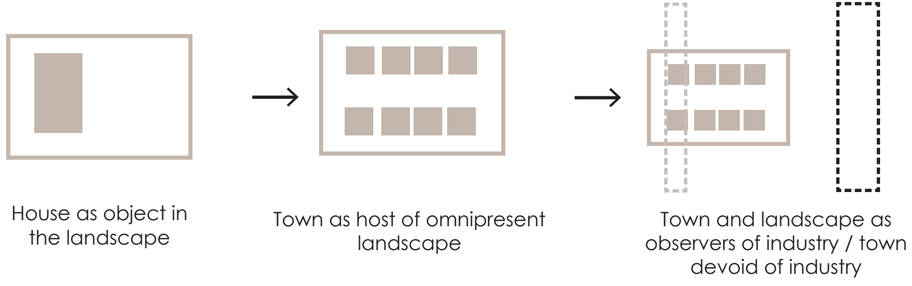

79 **Fig. 79** *Present day relationship of architecture, landscape and industry (Author, 2018)*

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4.3 Step 2 - Present Narratives - Finding value through the lens of the community

The card game was played with representative members of the community under the facilitation of community leaders.

The participants were divided into groups of five that would each contain a member of a specific community group in the larger community for example a member of the council of churches, a resident of the local old age home, a college student, a business owner and a representative of the pupils.

The idea was to identify on a map through colour coding the following:

a. positive sites that they feel are representative of the towns story of place (attractions);

b. negetives - things that are deterents and demotivating for locals and tourists and should thus not form part of the narrative and

c. moderate items - these would be items they felt indifferent about but have the potential of being significant to the story of place.

A site analysis of the present-day Boven was necessary to create a more indepth understanding of that which is existing to the community to ensure results that exhibit an awareness of objects of academic significance coupled with narrative based significance.

Fig. 80 *Results from card game (Author, 2018)*

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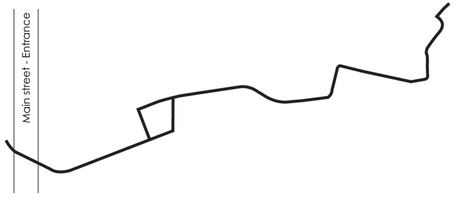

Fig. 81 *Vehicular entrance into town is unannouced and has potential and role to play with regards to the identity of the town as a railways town. (Google Earth collage by Author, 2018)*
Fig. 82 *View from past the bridge. Views of the natural landscape which was deemed to be an important image of the town considering eco-tourism has the potential to play a significant role into the economic and social well-being of the town. (Google Earth collage by Author, 2018)*

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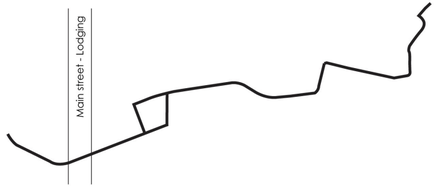

Fig. 83 *Example of C.S.A.R period type house converted to a restaurant. This particular building was seen as especially significant as it sits at the entrance of the town and thus carries the first impressions for town visitors. (Google Earth, 2018)*
Fig. 84 *Example of a badly adapted NZASM semi-detached cottage. The advice with regards to these type of alterations was to reverse that which makes the architecture of the town unidentifiable, especially on the main street of the town. (Google Earth, 2018)*
Fig. 85 *Local petrol station and convenience store was seen as an asset to the town as it is one of the only enterprises left that is still in good use. Its effect was deemed positive as it slowed down speeding cars on the main road.(Google Earth, 2018)*
Fig. 86 *C.S.A.R period type house, vacant. Residents were concerned about the amount of vacant houses in the town especially on the main road as this served as a deterrent for visitors and potential investors. (Google Earth, 2018)*
Fig. 87 *NZASM Single-men's quarters, the only such an example in the town badly altered, split into two separate commercial spaces and left vacant (Google Earth, 2018)*

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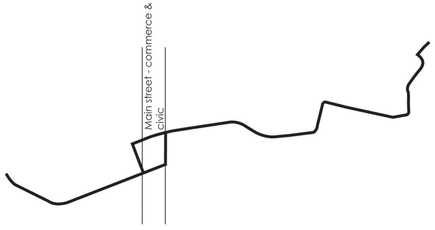

Fig. 88 *Waterval Boven Centenary memorial gifted by the First National Bank in 1993 was seen as a positive image for the town especially considering its proximity to the Post Office, library and community hall. (Author, 2018)*
Fig. 89 *Local library housed in former NZASM period Semi-detached cottages was seen as positive but could improve as did not make it easy for elderly to use, was not up to date with regards to technology and book collection. (Author, 2018)*
Fig. 90 *Local community hall could be improved as it is not well used, under maintained is apparently costs too much for the local council to maintain. Most of the community meetings now happen in one of the many churches in the town (Author, 2018)*
Fig. 91 *Local recreational hall / clubhouse in bad condition. Kids have nowhere to change when using the local swimming pool, has become a crime hotspot. (Author, 2018)*
Fig. 92 *Tavern across from the library seen as a negative due to children skipping school to "be in the library" and end up consuming alcohol (Author, 2018)*

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Fig. 93 *Local Post-Office. Brings temporary visitors in the form of SASSA pension collectors but is otherwise not the well utilised. (Author, 2018)*
Fig. 94 *Latest additions to the historic core of the town. Locals deemed this a positive as the local "U-Save" has created at least a few jobs for the residents. No architectural or historic significance was ascribed to it. (Author, 2018)*
Fig. 95 *NZASM headquarters building across the now derelict park. Suffered a tragic fire in 2015 but has undergone some renovations in 2017/2018 albeit that the renovations aren't architecturally accurate, the building is being maintained and put to good use. (Author, 2018)*
Fig. 96 *NZASM Portable rail-side cottage well preserved across the library. Community envisioned this to be the site for a new information centre for tourists. (Author, 2018)*

Fig. 97 *NZASM functionary's house converted into a pre-school. (Author, 2018)*
Fig. 98 *Town park planted with blue gum trees as original design. In the distance one can see the bowling club and behind that the Northern facade of the community hall. Concrete walls are retaing walls intended for the terracing of the recreational areas. The park itself is not maintained, its overgrown and becomes a crime hotspot when there is no electricity in the town. (Author, 2018)*

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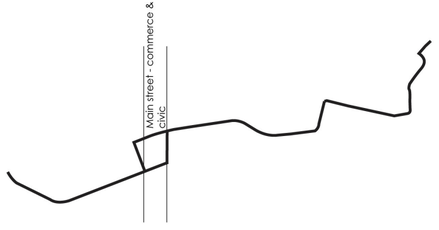

Fig. 99 *Originally built as the Chef's cottage, this building has undergone a number of changes including a conversion into a Post Office in the 1960's and later into a telegraph and call centre after the construction of the current Post Office. Presently it is being used as a laundromat for Transnet employees. (Author, 2018)*
Fig. 100 *One of the finer examples of a NZASM functionary's cottage built of stone imported from Belgium is currently being used as a night club. The buildings preservation as a significant building is under threat because of unaware current owners.*
Fig. 101 *What is left of the air compressor engine that was used to drill holes during the construction of the NZASM tunnel. There are several of these artefacts scattered around the town in need of preservation and curatorship. (Author, 2018)*
Fig. 102 *NZASM train station, still in use and well preserved by Transnet. (Author, 2018)*
Fig. 103 *Trains repair shed.*

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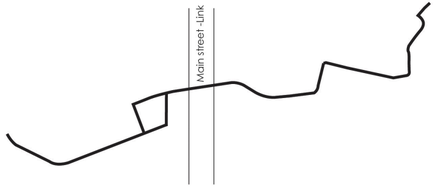

Fig. 104 *Main entrance to the former NZASM headquarters building. Deteriorated landscape features but could improve after renovation is complete. (Author, 2018)*
Fig. 105 *S.A.R & H steam train parked underneath the repairs shed. Currently unused. The trains were remembered by the community as the lifeline of the town due to the train enthusiasts that would use them. There was an indication that the cession of the tourist steam train led to a decline in tourist numbers. As a result the steam trains were considered an important item on the object of narrative significance. (Author, 2018)*
Fig. 106 *Street towards township (Collage of Google images by author, 2018)*
Fig. 107 *Community bakery which was intended as a rejuvenation project but failed in 2017 (Collage of Google images by author, 2018)*

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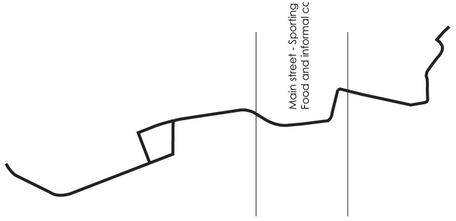

Fig. 108 *Sporting facilities linking the town to the township were seen as an opportunity to create a meaningful, active link between the town and the township. (Collage from Google images by author, 2018)*
Fig. 109 *Business district of the township where the town's "best grilled chicken" can be purchased. The area has supermarkets and nightclubs. It is the young vibrant area of the town. This area was identified as the gateway into a potential township tourism district (collage of Google images by author, 2018)*

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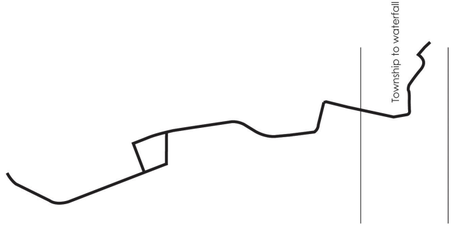

Fig. 110 *Example of how landscape fulfils subsistence needs of the community (Author, 2018)*
Fig. 111 *Random growth of corn and other starch based reed plants. This presents an opportunity for communal urban agriculture in unbuilt open lots. (Author, 2018)*
Fig. 112 *Historic Apostolic church still in use despite the buildings physical conditions. (Author, 2018)*
Fig. 113 *Cliffs on the escarpment where rock climbing occurs. The town is famous for its rock climbing scene. (Author, 2018)*
Fig. 114 *Example of NE51/9 in the township. (Author, 2018)*
Fig. 115 *Overgrown NZASM tunnel. Used to form part of hiking routes but has since become a crime hotspot. (Author, 2018)*
Fig. 116 *Example of semi-detached cottage for black mining workers during the SAR&H period (Author, 2018)*
Fig. 117 *Waterfall beside the NZASM tunnel. Famous for the scenery while rock climbing. (Author, 2018)*

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Building \ Values	age	historical	artistic	use	science	conflict	commemorative
site	Original town-plan by NZASM engineer and President Paul Kruger showing original intentions	Presence of the landscape and parks over time		TRACES FOR PAST: Park in its peak days. Recreational and productive with rose and tea gardens as well as a fish dam. Hints of this land-scape remain.	Design and implementa-tion of landscape and town design modelled after Agneta Park in Delft. This was the norm for industrial town design in the late 1800's. Pre-dating the Garden city theory of Howard.	Unsympathetic development has shrunk and almost completely destroyed the park and surrounding landscapes. It is survived by the tennis courts and the blue-gum trees	
structure	Frozen as object in the landscape / Town as object surrounded by landscape / Town and landscape as effects of industry	Type houses in relation to each other vs high ranking officials in relation to town-plan and proximity to station and main buildings	Connection to trains and to the natural land-scape beyond. Buildings never compete in height from highest point to lowest		Typological housing was the modus operandi for most industrial towns in the day especially in the railways enterprise. This typology can be found replicated in other sister towns albeit at a smaller scale		
skin	Materials used in the historic core. Stone: wall and plinths Metal sheeting: roofs and walls	Original buildings built in corrugated sheeting. Houses were imported from the Netherlands. Stone replaced the metal due to the climatic conditions of the Waterval Boven - moisture and heat				Maintenance, additions and alterations of buildings is unsympathetic and threatens character of town. Some instances a mimic-ry is attempted with various plastering tech-niques which does more harm than good	
space plan		Hierarchy of space directly related to hierarchy of rank. Park is ordering device		Recreational public spaces as well as streets used extensively giving reason to strategic around the development of these spaces			
services	Towns ontology as service centre for railways hasn't changed except the decline of passenger rail and shrinking of industry	Most buildings servicing the trains have been con-verted into other functions mainly residential. Nothing has replaced the industry of the town	Relics of the industry remain in the town and are in use in various ways. Eg. NZASM railway tracks re-used as fence posts.				Memorial to the NZASM at the town train station
stuff	Objects that were made before the town and used to create the railways infra-structure are scattered on the landscape close to the station. Some of the items have been stolen	Objects of technological advances illustrating the systems that were used to run the railways in the tough terrain. Abandoned	Steam trains that are still operational. Potential for re-use	Group of enthusiasts called the "Oosteyn" - maintain the trains for leisure. Other objects of significance are scattered throughout the town commandeered by private citizens	"Stuff" in the town signifies a period of innova-tion in the field of technology by a cosmopoli-tan company traversing unfamiliar landscape	Little to no care and narrative built around these objects and thus neglected	Objects have potential to be re-used, or restored for telling the story of the town. A restoration and preservation intervention is needed
story of place							

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118 **Fig. 118** *Result of card game - Waterval Boven experience plan (Author, 2018)*

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4.4 Step 3 - Waterval Boven, a monument - statement of significance

The cards of fig. 79 and 80 were the result of the game.
Waterval Boven can be defined as a cultural landscape when analysed through the lens of article 15 of the BURRA Charter which describes a cultural landscape as a "landscape that is culturally significant in its aesthetic, historic, scientific and social values" (The BURRA Charter, 2013: 15).

The analysis and inventory generated from the story of place illustrates that town is representative of a unique aesthetic and technological era spearheaded by the NZASM endeavour of the 1800's Zuid Afrikaanse Republiek (ZAR). Waterval Boven's survival is valuable to the knowledge of the way in which place was made and the influence of technology (industry) in the making of place, not only in Waterval Boven, but also in the family of towns dotted along the NZASM tracks, which Waterval Boven forms a part of. The town in this respect also exhibits strong ties to international practices of industry driven place making. Making the town part of a shared heritage with countries like the Netherlands and Indonesia.
The town is host to various precincts that are representative of other institutions of national significance that made architectural contributions to the landscape of Waterval Boven before and after the NZASM. Thus the tangible and intangible remnants of these institutions render the town important through associations with the larger South African railways community and international interested parties by way of associated persons, technologies, institutions and knowledge. As a monument the town is significant in revealing different labour and political practices of the various periods, especially with regards to industrial housing typologies, town planning practices and varying housing models for the different racial groups in South African history.

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Chapter 5

Programme

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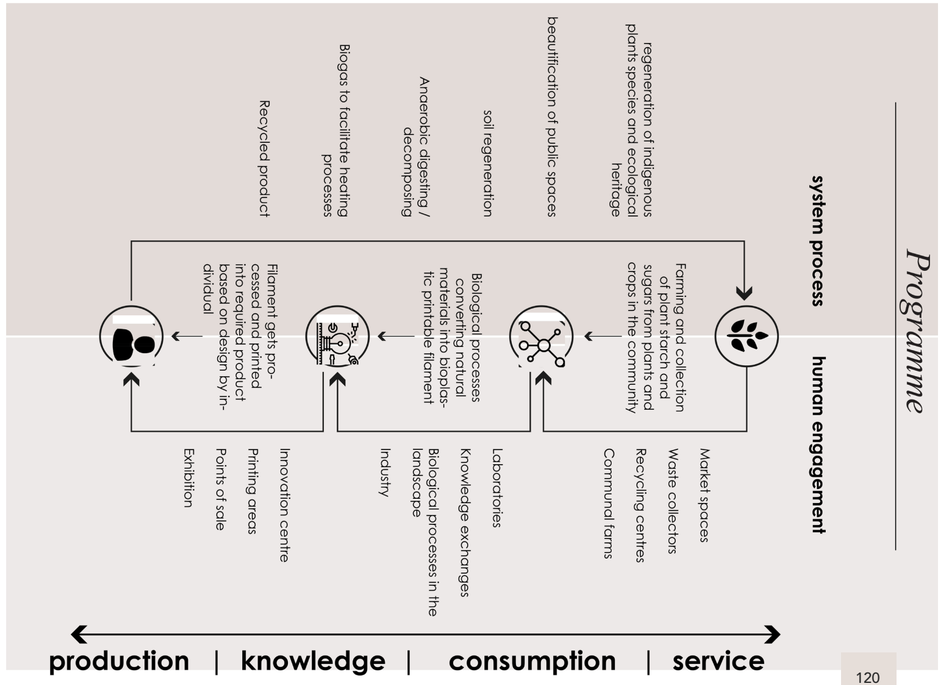
Fig. 119 *Steam train coming from the West of the tunnel where the township is built. Pictured is the rack-rail locomotive pushing the train and rack-less locomotive leading.*

5.1 Programme intentions

The proposed programme for the town should be reflective of the industrial history of the town; it's present functional ontology as an eco-tourist destination and magnify the reason for the significance of the town – industry and technology.

On an urban scale the intervention can be described as a series of narrative manifestations merging production, knowledge creation, consumption and services. The processes begin in the urban space, insuring that the (re) industrialisation of the town is entrenched in the everyday thereby reinforcing the old and new reason for the existence of the town – an ecological industry.



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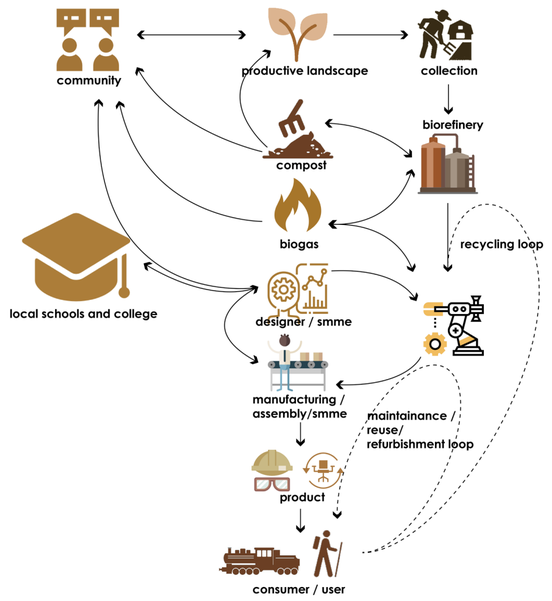

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Fig. 120 *Programme process (Author, 2018)*
Fig. 121 *Feedback loops of the programme processes (Author, 2018)*

The programme need not be all mechanics and industry. In any a regenerative system, there is a responsibility of feedback loops that need to occur between the various components of that system. The opportunity for passive and express teaching has been identified as one of these feedback loops – everyday residents, students, technology enthusiasts and academics can participate in the manufacturing process through:

1. **Production** – The proposed additive manufacturing programme is a build up from the town's historic function as a service centre for NZASM trains along the Eastern line. The dissertation envisages an historic full-circle – products created here could service all plastic components of passenger- as well as freight trains traversing the railway line to Maputo, replacing all existing, unsustainable plastic components like seating, handrails, toilet stalls in long distance trains, train switchboard covers, luggage compartments and so forth, with biodegradable ones. In an instance where the component has waned, these could be brought back to the town for reuse, maintenance, refurbishment or recycling.
2. **Knowledge creation** – 3d modelling training, theory of additive manufacturing, operation of robotics and materials studies could form part of the offering at the local college ensuring local labour at all levels of the production system. These new skills would not only suffice for Waterval Boven but also make the participants globally competitive with skillsets of the future.

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3. **Consumption** - Products developed and manufactured in the town could service the local lodging, Eco-tourism, tourist goods and plastic industries. By-products of the industry are biogas and compost which could serve as an incentive for the locals to participate in the collection and deposit of raw material at the facility.

4. **Services** – Products will have a wear and tear in their lifespan. The proposal sees this as an opportunity to ascertain a regenerative circular economy where bio-plastics based goods can be maintained and recycled in Waterval Boven. At present, South Africa has only two bio-refinery plants. The first, Sasol, deals with petroleum, are experimenting with bio-fuels and the second, the Council for Scientific and Industrial Research (CSIR) who are testing the feasibility of this technology in our context. With this in mind, the programme incorporates a much needed service for not only Waterval Boven, but the country at large. The service thus lends itself the capacity to extend the potential of the programme to neighbouring towns and even the country as a whole.

5.2 Clients

When addressing issues of place through a regenerative remodeling process, the story of place take precedent in what is to become of the particular heritage conservation project. Thus, decisions are made by the collection of the stakeholders and each stakeholder is to benefit from this process in his or her own territory (Goudswaard, et al., 2012, p. 141) .

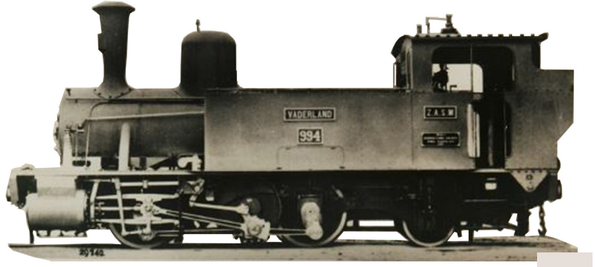

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Fig. 122 *The "Vaderland" rack-rail locomotive of the NZASM (Boven se Storie in Beeld en Woord)*
Fig. 123 *Plastic components that can be made from bio-plastics*

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Transnet

Waterval Boven was and still is, to a degree, a railways town and though it may not be in full custodianship of neither the state nor Transnet, its economy as well as corporate social responsibility projects are spearheaded by the state owned enterprise, Transnet.

The dissertation's proposal is an opportunity wherein Transnet finances and spearheads the project in its inception through providing the necessary start-up capital. In a regenerative systems thinking fashion, Transnet does not go empty handed of course - trains, especially passenger trains have a lot of plastic based items in them – chairs, grab rails, luggage compartments, seats etc. which could all be made and maintained in Waterval Boven, using bio-degradable products. In this way, the project goes full circle with regards to Waterval Bovens railways narrative.

Mpumalanga Tourism and Parks Agency (MTPA)

Most of the small towns, especially historic towns, in the Mpumalanga province's upgrade and maintenance responsibility has been handed over to the MTPA, relieving the Public works department from this task due to the department's dismal failure at the task at hand (Emakhazeni Local Municipality, 2015).

The MTPA thus has the mandate, according to their constitution, to facilitate and implement promising projects that would see the development and improvement of these towns in both social economic terms as well as the tourism product offerings that these towns have via their inherent cultural significances. (CHL Consulting LTD, 2007).

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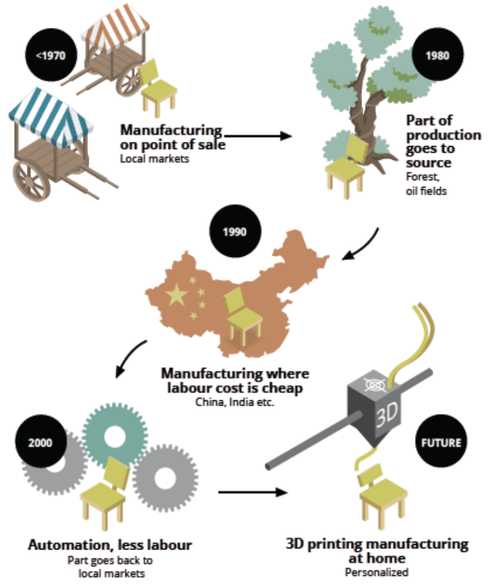
Locals – "Boven Reboot"

The locals of Waterval Boven stand to benefit the most from the envisaged programme. Whilst the programme is mechanic and technology based, it has the capacity to weave between the four scales of production: the primary, secondary and tertiary sector. This implies an opportunity for a significant amount of new skills and jobs to service the program, alleviating the towns unemployment rates.

5.3 Additive manufacturing - A brief history

Although additive manufacturing, commonly known as 3D printing, is seemingly a new technology, it has been around, or at least the idea of it, since the 19th century in the form of layered topographical map printing (van Wijk & van Wijk, 2015: 27). The 1980's were really the golden years in the development of this technology by way of proponents such as Hidoe Kodama of the Nagoya Municipal Industrial Research Institute in China, who published the first account of a working photopolymer rapid prototyping system in 1981 (van Wijk & van Wijk, 2015: 27). In 1984, Charles Hull developed the first working 3D printer based on the StereoLitographic process which in 1992 produced the world's first 3D printer (van Wijk & van Wijk, 2015).



124 **Fig. 124** *Benefits of additive manufacturing to local industry (van Wijk & van Wijk, 2015)*

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To date, the technology has proven to be disruptive in many industries like medicine, engineering and most importantly industrial manufacturing (van Wijk & van Wijk, 2015). Since the multiple successes the technology has achieved, enthusiasts have attributed the trigger to the third industrial revolution to additive manufacturing (van Wijk & van Wijk, 2015). Fig(123) graphically illustrates this disruption according to van Wijk and van Wijk (van Wijk & van Wijk, 2015).

The diagram summarizes the promise of additive manufacturing (van Wijk & van Wijk, 2015):

1. Once again, just as before the first industrial revolution, products can be manufactured at or close to the location of consumption;

2. products can be mass custom-made for the user at a rapid speed with minimal room for error and wastage and finally;

3. a new way to develop and design existing and new products beginning with a co-creative design process

125 **Fig. 125** *Process from feedstock to bio-plastics to product (Author, 2018)*

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5.4 Bio-plastics

Whilst 3D printing technology itself has been attributed to being the reason for the third industrial revolution, it is the new wave of materials attached to this industry which is generating murmurs about the so-called fourth industrial revolution (van Wijk & van Wijk, 2015: 37).

Van Wijk and van Wijk paint a bleak image of the future reminding us that by the year 2050, the earth's population is estimated at 9 billion people and that our livelihoods cannot be sustained at the rate at which we're consuming non-renewable resources (van Wijk & van Wijk, 2015: 38). In contrast, for as long as there is organic was of one form or another, biomass is a renewable resource prompting an economy driven by this resource – a bio-based, circular economy.

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Bio-based additive manufacturing encourages a world where the annual 60 million tons of plastics consumption (in Europe alone) can be replaced with bio-plastics (van Wijk & van Wijk, 2015: 39). The graph below illustrates plastic usage in Europe alone. Africa and the Middle East consume 7.2 % in plastics annually according to 2012 figures (van Wijk & van Wijk, 2015: 42).

Curiously, the notion for the use of bio-plastics is not unique to the fourth industrial revolution. The world's first ever plastic, celluloid, was in fact a bio-based plastic used for the production of billiard balls, replacing the much valuable ivory which preceded this technology (van Wijk & van Wijk, 2015: 43).

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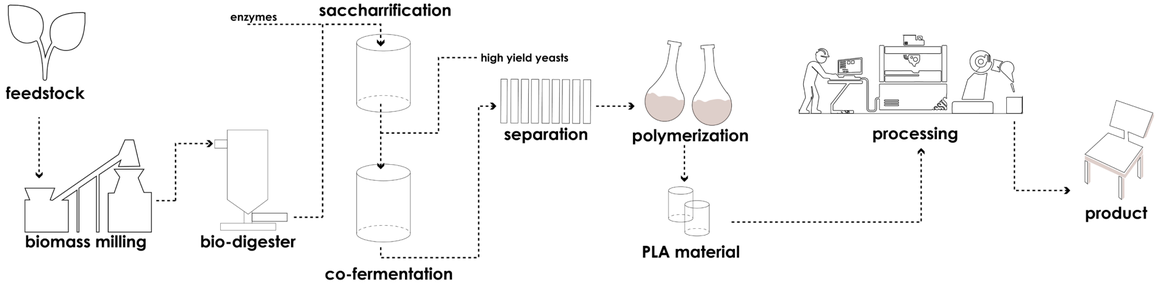

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The development of the technology was abandoned in favour of much cheaper oil-based polymers (van Wijk & van Wijk, 2015 :43) .

The 1980's saw the resurrection of the bio-based plastic (van Wijk & van Wijk, 2015: 43) following the global awareness of perishing resources and a drive towards reuse, reduce and recycling.

The fact that the plastics can be made from plant starches was a fundamental driver for this resurrection as researchers came to understand that there is a steady and almost endless supply of the raw material that is needed to make the bio-plastics (van Wijk & van Wijk, 2015: 43)

Fig. 126 *Process from feedstock to bio-plastics to product (Author, 2018)*

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5.5 Process:

To produce bio-based plastics, numerous types of crops can be used to extract sugars, starches, oils or lignocelluloses (van Wijk & van Wijk, 2015: 45). These crops range from wheat straw, corn cobs, corn stover, apple waste, banana stalk, corn stalk, cotton stalk, pomegranate waste, sugarcane waste, banana waste, barley waste peanut husk and pine wood shavings (Ghaffar, et al., 2014: 226)

There are about eight methods through which one can convert the crop feed stock into bio-materials (van Wijk & van Wijk, 2015: 48):

1. Gasification, resulting in syngas or methanol, and subsequent conversion into materials
2. Pyrolysis, resulting in bio-oil, and subsequent conversion into materials
3. Catalytic conversion of biomass into materials e.g. furanics
4. Pulping, resulting in paper and possible lignin derivatives (cellulose)
5. Other physico-chemical synthesis of materials
6. Fermentation using micro-organisms, resulting in chemicals and intermediates (starch)
7. Enzymatic conversion, resulting in chemicals and intermediates
8. Extraction of feedstock from traditional crops, resulting in e.g. vegetable oil for lubricants
9. Extraction of materials that were produced in plants, such as PHAs

The dissertation opts for options 1 and eight because the 1) gasification process has a by-product of biogas which can in turn be used for heating purposes in the bio-refinery process and the heat energy could also be used in the 3D printing facility where a lot of heat is required for the running of that process. Excess gas could be distributed for cooking and heating in the town and township areas. 2) The extraction of feedstock which results in certain oils for lubrication will stimulate other unrelated opportunities such as the creation of soaps, cooking oils and lubricants, varnishes, paints and sealants.

The lubricants could of course then be used by manufacturers when assembling products that need lubrication like for eg. Office chairs, thereby creating the closed economy that van Wijk and van Wijk wrote about as the promise of this industry (van Wijk & van Wijk, 2015: 48).

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Conceptual intention	Main Programme	Spatial implication	Area
Production	1. Cultivation	1.1 Landscape terraces 1.2 Cultivation platforms 1.3 "Deposit boxes" 1.4 Material store	- - 156 sqm
	2. Feedstock Preparation	2.1 Weighing 2.2 Testing laboratories 2.3 Grinding	 213 sqm
	3. Process	3.1 Bio-digestion chamber 3.2 Gasification chamber 3.3 Control laboratories x3 3.4 Bacteria farming pond 3.5 Enzyme laboratory 3.6 High temperature cooling chamber 3.7 Separation chamber 3.8 Drying room	 183 sqm
	4. Post processing	4.1 Packaging 4.2 Dispatch area 4.3 Dispatch office 4.4 Product store 4.5 HVAC	 90 sqm
	5. Employee spaces	5.1 Administration office x2 5.2 Seminar room	

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		5.3 Ablutions & washrooms	 150 sqm
Knowledge creation	6. Business incubator 7. Library	6.1 Office 6.2 Co-working spaces 6.3 Educational landscape 6.4 Auditorium 7.1 Archives 7.2 Refreshment area 7.3 Reading room 7.4 Study area 7.5 Material delivery 7.6 Librarians office 7.7 Checkout area	 720 sqm
Consumption	8. Printing facility	8.1 Delivery yard 8.2 Material store 8.3 Large scale printing 8.4 Small scale printing 8.5 Assembly rooms 8.6 Cleaning room 8.7 Drying room 8.8 Product store 8.9 Exhibition	 400 sqm
Service	9. Oosterlijn Workshop	9.1 Material delivery 9.2 Material store 9.3 Staff WC 9.4 Kitchenette 9.5 Assembly workshop 9.6 Installation gallery 9.7 First aid room	 100 sqm

Chapter 6
Precedents

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Fig. 127 *Locomotive round house at Waterval Boven. Here the locomotives would be repaired and maintained. This typology which once existed in Waterval Boven, Waterval Onder, Salvokop, Pretoria Station (to name the confirmed locations) is no longer in existence. They only exist now in image and text. (Boven se Storie in Beeld en Woord, 2001)*

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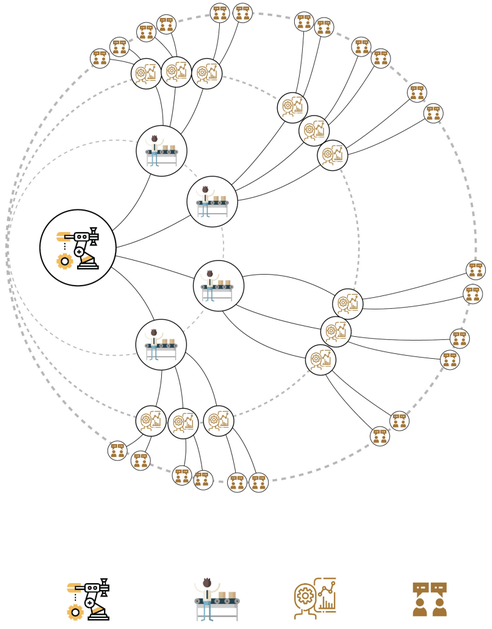

128 **Fig. 128** *Shapeways business model that intergrates / links individual and corporates that have ideas or businesses that can make use of the production facility to trained designers in remote (or at a set location) areas where modelling and technical assistence is available. They then send designs to the manufactures that are at the various assembly locations (or at the factory, turning it into a co-working space). (Author, 2018)*

Shapeways – an enterprise for the masses (operational model)

As concluded in the theory chapter, part of the regenerative remodeling strategy is the engagement of human institutions in the creation of life-enhancing practices. This conclusion suggests the possibility of engagement from all parties within a given system. In the additive manufacturing world a company called Shapeways has begun the disruption of industry as we know it and have fully embraced the fourth industrial revolution in a 21st century democratised manner.

Shapeways was founded in Eindhoven, Netherlands in 2007 by participants of the Philips Lifestyle Incubator program which offers support and infrastructure to start-up companies in the region (see Strijp S section below). The company was founded on its service as an additive manufacturing hub which allowed customers from anywhere in the city (at the time) to design their own 3 dimensional prototypes and send the design files to the hub through a webpage where the designs would get printed on demand for prospective customers (Shapeways, 2010, p. online). Shapeways' value proposition was the handling of clients' financial transactions, manufacturing and distribution of printed goods (Smith, 2012, p. online). They became like an UBER for manufacturing. Their clients are businesses who operate in a digital market place offered by Shapeways.

In 2012 the company relocated its headquarters to New York City in the USA due to rapid growth (Shapeways, 2010, p. online). Their manifesto is founded on the return of localised industry and have since been in the process of building factories closer to the areas where they have a lot of clientele. Fig x illustrates the business model.
At present the company manufactures for over 45 000 businesses globally and shipping to over 130 countries worldwide.

129 **Fig. 129** *Current global users of the facility. The company builds factories where demand is high as a reaction to the company's manifesto which is to localise production. (Shapeways.com)*

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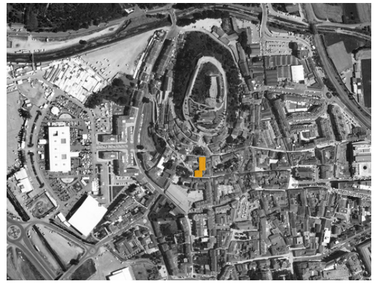
6.2 Approach precedent - Appropriate Remodelling



Transforma Art Studios

Architect:
Pedro Gadanho / CVBD arquitectos

Location:
Torres Vedras, historical city,
Portugal

Area: 1750 sqm

Year: 2014

Remodeling with the intent of rejuvenation without disrupting character of place is as much about strategic programming and intervention as it is about the scale of the remodeling exercise.

In the run up to the project commission in 2014, the historic core of Torres Vedras in Portugal was dormant, underutilised and on the brink of complete disrepair (CVDB Arquitectos, 2014: online).

These conditions of a stale economic and cultural environment were slowly creating an uninspired youth with no interest in the towns historic artistic reputation (CVDB Arquitectos, 2014: online).

When a Tranforma Art Studios approached the architects to build their headquarters in this context, the architects rightfully opted for a regenerative strategic solution where instead of building a new 1750 sqm building, the architects opted to use this injection as an opportunity to rescue the historic built fabric of the city. The project would encompass the accommodation of an arts centre dedicated to music, performance, new media and visual arts (CVDB Arquitectos, 2014: online).
The new building was seen as a programmatic insertion rather than a new building, which would occasionally express itself through new urban streets and sculpture-like forms that contrast their context to highlight certain programmatic features out of the old roofs and facades.
The architects described the insertions as a “series of organs”, with the theatre being the “kidney” (CVDB Arquitectos, 2014: online) in an allegory of the programme being the lifeline intended to rejuvenate this historic centre.

Lessons: sensitive insertion, using new buildings to give new presence to the old. Adding large scale to small place.

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6.3 Approach precedent - **Regenerative** Remodelling in practice I

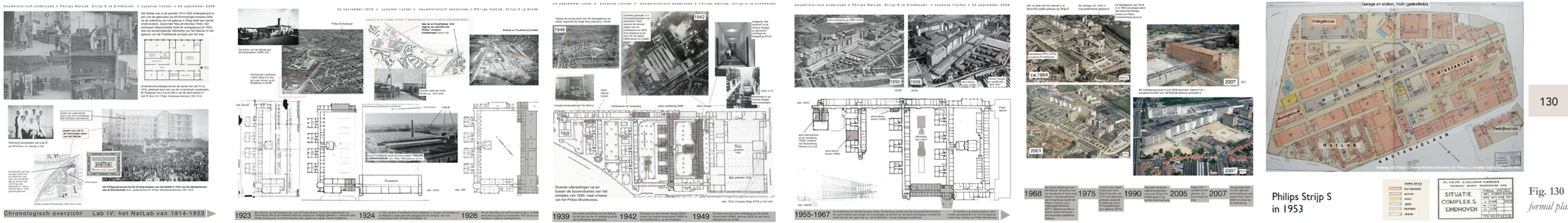

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Fig. 130 *Value assessment and generation of Story of Place before formal planning for Strijp S (Gelinck & Strolenburg, 2014)*

Strijp S, Eindhoven, Netherlands

The concept of rejuvenation through story of place with the intention of a regenerative environment, read regenerative remodeling isn't a new one albeit that it hasn't necessarily been documented as such. The Stijp S rejuvenation scheme in Eindhoven, Netherlands is an example of one such rejuvenation of a post-industrial landscape.

Story of place

Strijp S is a post-industrial area in Eindhoven which owes its existence to the electronics company Philips (Trudo, 2007: online). Founder of Philips, Anton Philips started his company in 1892 and just after 10 years into existence, Philips had manufactured up to 1.5 million incandescent light bulbs (Trudo, 2007: online). In 1916, Anton built a glass blowing factory on the Strip to minimise dependency on suppliers. As the company grew, it needed more space to accommodate its glass and box factories, staff accommodation, innovation centres etc. to supplement the company's growing needs. This expansion led to the formation of other Stripes R and T by the 1970's to house the company's over 10 000 day employees (Trudo, 2007: online).

The company's global expansion led to its gradual decentralization of resources and eventually the company moves out of the region completely by the year 2000 (Trudo, 2007: online) leaving the place dormant and in disarray with rampant unemployment and consequential threat to the industrial heritage in the area (Gelinck & Strolenburg, 2014: online).

Methodology

In 2002 Philips Strijp-S sells the property to a venture comprising of local industry and the municipality of Eindhoven, Stichting Trudo, (Gelinck & Strolenburg, 2014). The redevelopment project created a four step toolkit (O'Donnell, 2007) for successful implementation.

Step one of the intervention began with a commissioning of a heritage valuation in order to determine the strategy for redevelopment for the area and to establish the rules for redevelopment. This allowed an educating of the general public as well as professionals to encourage maximum participation.

Step two was a development of understanding of the available financial tools. The implementers had to facilitate and foster relationships between various stakeholders, public and private. Also the role of the municipality in this regard was the creation of conducive conditions for the success of the project in the form of easement of property rights transfers, crowd sourcing initiatives and making loans available for kick-starting the project (Gelinck & Strolenburg, 2014).

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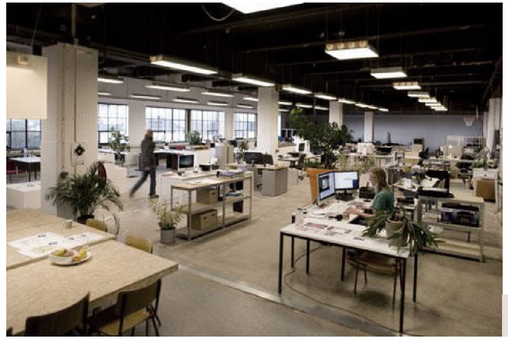

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Step three was establishing advisory tools in the form of active participation of the experts involved (O'Donnell, 2007: online). In this case the experts used a series of strategies for place-making (Gelinck & Strolenburg, 2014: online):

1. Short-term reprogramming of built fabric which not only allowed for the re-habitation of space but rekindled the entrepreneurial spirit of the community. This came in the form of the adaptive re-use of buildings to accommodate restaurants etc. and public space (concerts and other events). To link it back to Brand, this intervention functioned at the level of "stuff" and "space-planning". The fast changing elements of place.

2. Mid-term reprogramming included, like in the point above, adaptive reuse of buildings and space, except here, the interventions move towards the adaptation of services. These changes to place are semi-permanent and potentially alter the ontology of place. An example of this is the establishment of the Dutch design week that happens in the area showcasing the design and innovation of the local entrepreneurs there.

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Fig. 131 *Sidewalk cafe's along one of the former Phillips factories now converted to restaurants etc.*
Fig. 132 *Co-woring spaces. One of the many adaptive re-use projects in Strijp-S*
Fig. 133 *Imange of the revamped buildings along a regenerated landscape now acting as one urban intervention (Gelinck & Strolenburg, 2014: online)*

3. Long term reprogramming speaks to place and narrative directly. Here the University of Eindhoven was brought in as a stakeholder to house some of its facilities in the strip through the financing of Philips and the municipality. The University enjoys an identity of being the design institute of the country, just as Philips was, thus this reprogramming slotted within a continuum of narrative of place and enabled other small innovators to inhabit the area making this the design capital of the country.

Step four, the establishment of regulatory tools ensured the maintenance of ideas and concepts as well as sensitivity towards the new values placed on site. The success of this methodology is reason that today the area is home to innovative companies investigating technology, typologies of housing, designer fashion and furniture – all being researched, designed and produced in the area as it were during Philips' peak years in the 70's (Gelinck & Strolenburg, 2014).

Lessons: using story of place to inspire appropriate (re)development without percieving the story as hindering developent.

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6.4 Approach precedent - Regenerative **Remodelling** in practice II

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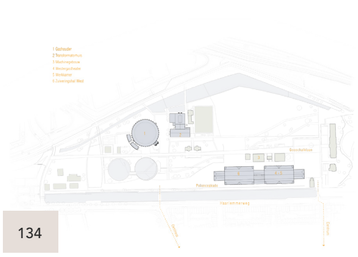
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Fig. 135 *Westergasfabriek during coal production days (Braaksma&Roos, 2002: online)*

Fig. 134 *Redevelopment site plan (Braaksma&Roos, 2002: online)*

Fig. 136 *Adapted & restored buildings(Braaksma&Roos, 2002: online)*

Westergasfabriek bv, tony's chocolonely, vara, kunstbende, studio parker, and others

Location:
Haarlemmerweg, amsterdam

Year:
2002 - 2007

Size:
130,000 m2

Program:
Theater, pop podium, restaurant, commercial rental, exhibition spaces, studios

In the 70s and 80s the city of Amsterdam had a major shortage of green and recreational facilities (Braaksma&Roos, 2002: online). The polluted site of the Westergasfabriek was earmarked for the location of a city park. After remediation of the site and the temporary use of the buildings in the 1990s, the potential of the Westergasfabriek to become a cultural hub for the city became undeniable.

The office of Braaksma & Roos were tasked in 2001 with master-planning the (re)development of the site as well as supervising the adaptive re-use and restoration of 17 monument buidings in the precinct.

The architects defined their intervention on an urban scale as followes (Braaksma & Roos, 2002: online):

"FROM BROWNFIELD TO GREENFIELD

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Fig. 137 *Day-function - building as textile workshop*
Fig. 138 *Night function - exhibition venue (Braaksma&Roos, 2002: online)*

Fig. 139 *Old gas chamber converted into new auditorim using the old as a plinth to house the new (facade) yet internally old and new function as one (Braaksma&Roos, 2002: online)*

The industrial buildings form an inseparable unity with the surrounding terrain. The landscape design of Gustafson Porter emphasizes the industrial, monumental character of the complex on the one hand, but also, on the other hand, the hard appearance of the factory buildings. The park stimulates all the senses - you hear water flowing at the marsh ponds and the train disappears behind the slope. There are hard, tough concrete slabs in the park, but there are also colorful flower fields. In the gas tank ponds you will find screened decking for picnics. The park therefore offers both space and intimacy"

The buildings too were remodelled to disrupt the existing as little as possible. To not repeat the mistakes of the past, the architects altered the spaces to be as adaptible as possible so that they can accommodate whatever function required by the users.

The buildings are thus active with a twenty-four hour cycle and thus have a future-proofed layer added.

The converstion of the gas chamber into a theatre is the highlight of the project. Here the intervention almsot completely transforms the old industrial and gives it an architectural bearing - giving the old a new presence to co-exist with the new.

Lessons: Architectural remodeling and the act of adding to buildings with new ontologies.

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6.5 Material precedent - Regenerative **Remodelling** in detail I

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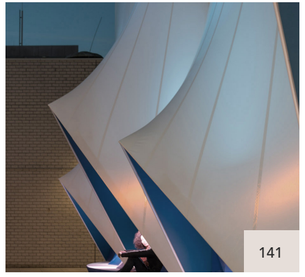
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DUS architects, a firm based in the Netherlands was commissioned to design a temporary meeting space where the **European Union** would meet for the first six months of **2016**, the Mobile European Building (Frearson, 2016: online).

The firm drew inspiration from the temporality of the brief and responded with a building that would be equally temporal, a building that can be fully recycled after the six months lapsed.

The firm being one of the leading architects in research for construction using 3D printing relied on their expertise to make the building from newly researched bio-plastics. The skin of the building is twofold: 1. The tent like fabric wraps around the building in tension and at times revealing 3D printed pockets that become seating for the public.

The tensile fabric as well as the 3D printed blocks are made from linseed oil – an oil made from bio-refining starch-based plants into poly lactic acid (PLA). The fabric itself is made from heating, extruding and cooling the PLA into large malleable sheets which are applied in tensile structures as building cover. The PLA is infused with a fire retarding solution before extrusion, giving the sheets a fire rating of at least an hour.
The 3D printed components are extruded frames creating a permanent formwork and finish wherein concrete is poured for structure, aesthetic and weather and fire proofing.

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Fig. 140 *View of the pavilion with the fabric revealing the 3D printed "inner skin" of the building*
Fig. 141 *Texture of the fabric in tension.*

Fig. 142 *Mobile European Building by DUS architecs, full view (Frearson, 2016: online).*

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Chapter 7

The Monuments moment - Towards a working cultural landscape

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Fig. 143 *Eastern entrance into the tunnel. Pictured are the satisfied contractors after 11 months of relentless construction under unusual topographical, climatic and illness ridden conditions. (Boven se Storie in Beeld en Woord, 2001)*
Fig. 144 *Western entrance of the NZASM tunnel circa September 1893 (Boven se Storie in Beeld en Woord, 2001)*

7.1 Site inventory - Perceptual Mapping

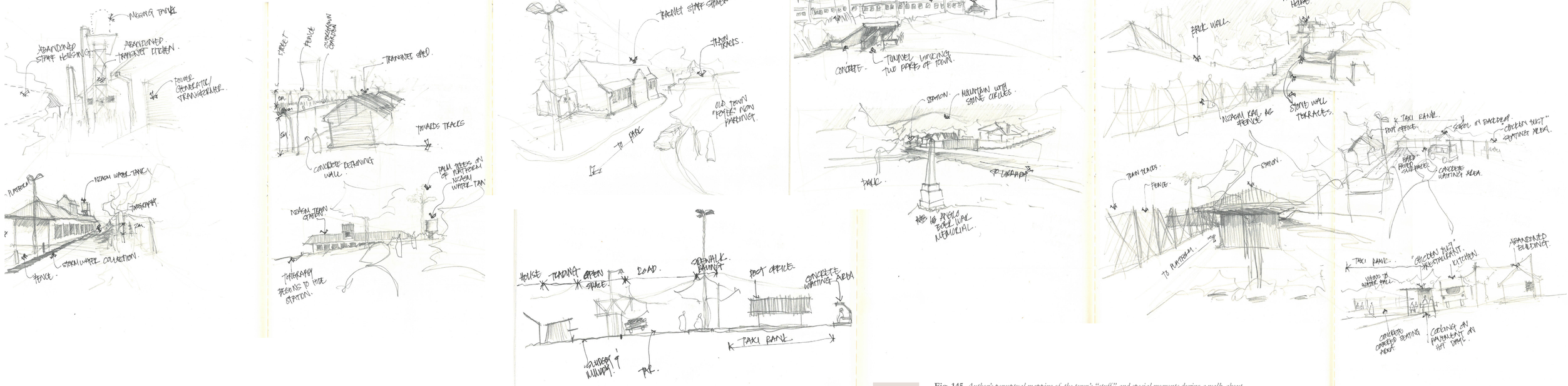

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Fig. 145 *Author's perceptual mapping of the town's "stuff" and special moments during a walk-about with locals. (Author, 2018)*

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7.2 Site inventory - Analysis

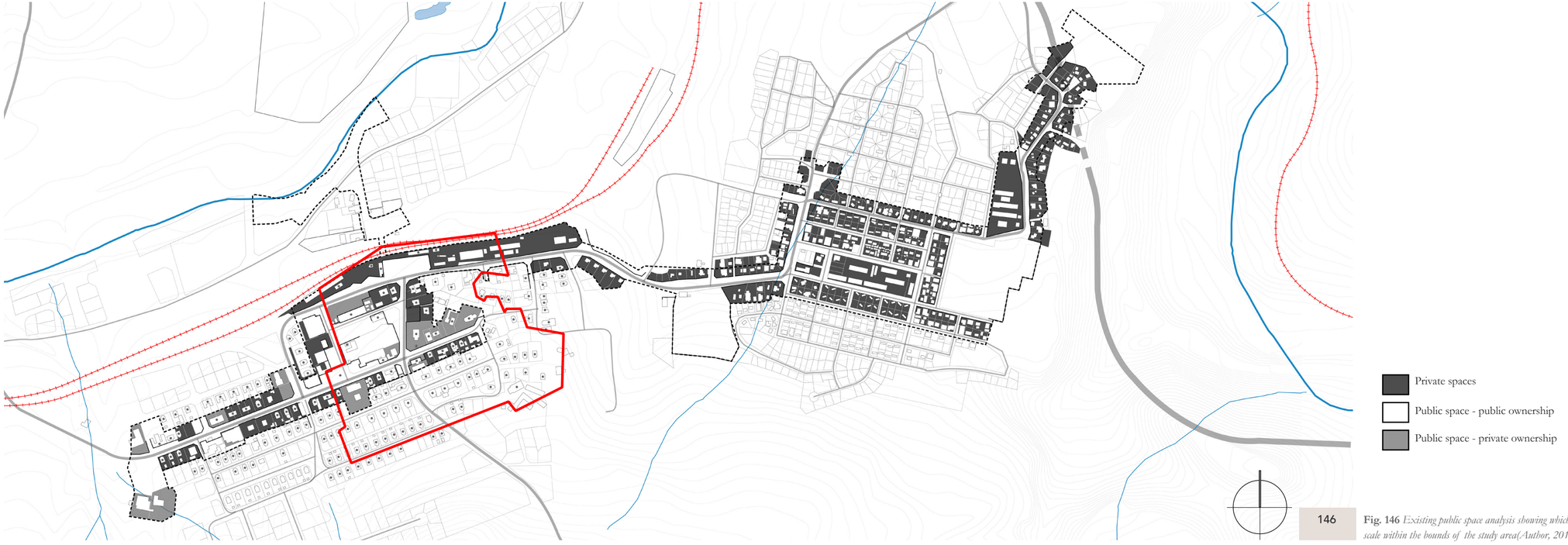

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Fig. 146 *Existing public space analysis showing which spaces are developable based on ownership and scale within the bounds of the study area(Author, 2018)*

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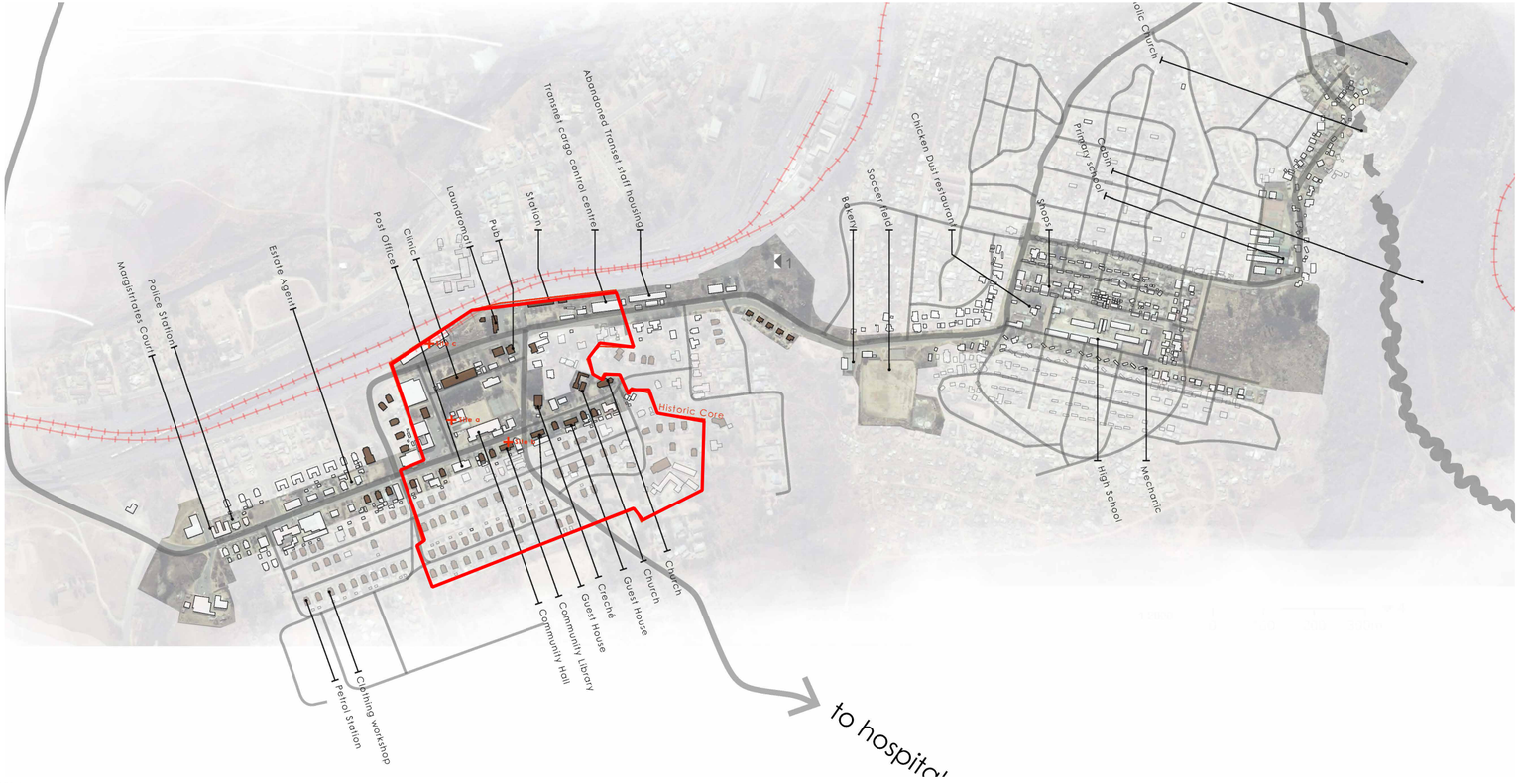

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Fig. 147 *Existing programmes and activity within the study area. Red outline indicates historic core (Author, 2018)*

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148 **Fig. 148** *Existing open space system (Author, 2018)*

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7.3 Macro scale vision - A line of sites - The Industrial promenade through time

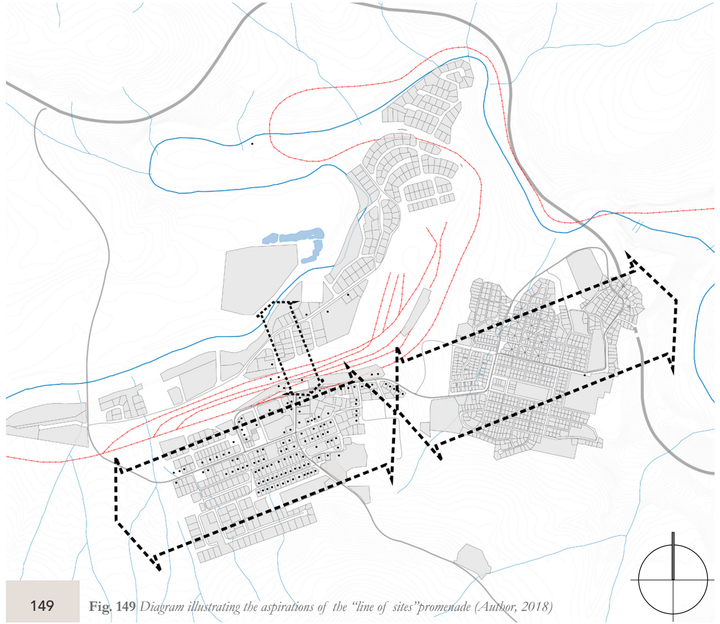
A line of sites is a series of squares, urban courtyards, 'foyers' and 'lobbies', public commons that mark the various ontologies, historic identities, memories and cultures, bound by a promenade of an omnipresent landscape of industry.

Aspirational brief

The promenade articulates itself along the main artery that runs from the entrance of the town, linking the historic core to the commercial hub of the township and terminating at the waterfall.

The promenade presents itself as a natural device to bridge the spatial and activity divide between the township and the town. It has the potential to bridge spatial and heritage identity politics through creating a spatial link between two otherwise disparate communities.

Existing activity along the artery can facilitate an original experience of the town for local and visitors. With added foot traffic and activity the route could present an expansion and improvement of economic and social activity.



149 **Fig. 149** *Diagram illustrating the aspirations of the "line of sites" promenade (Author, 2018)*

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7.3.1 The Ontologies of Waterval Boven

In the making of a successful precinct that caters for both residents and visitors, it is essential to (re)create order in the historic town to fulfill the purpose of legibility, identity and place (Griffin, et al., 2008). This order will, whilst creating a unique and authentic experience for the end-user, also guide and shape the direction of future development.

The town is thus divided into various precincts which will serve a unique functional ontology for the end-user. The intention of these precincts is to understand the functions of place, from the existing to imagined, in order to create a place that meets the demands that other places cannot satisfy.

The functions of the precincts are, according Griffin, et al. (2008) as follows:

1. **Facilitate** – These are iconic, relatively well known places where the locals meet tourists before embarking on activities. Here, transport interchanges are obvious and legible. These spaces should offer an opportunity for an experience compression.
2. **Place-connectors** – These are spaces that should offer the tourist a relation and or appreciation of the place they're visiting. They should exhibit, clearly, the way of life of the locals, the history of place and they should be distinct from all adjacent places for legibility.
3. **State-of-mind** – labile[4] spaces that make the visitor feel part of the place. Places that contrast the rest of the town. Places that encourage a mental slowing down.

[4] Labile - of or characterized by emotions which are easily aroused, freely expressed, and tend to alter quickly and spontaneously (Oxford dictionary: online)

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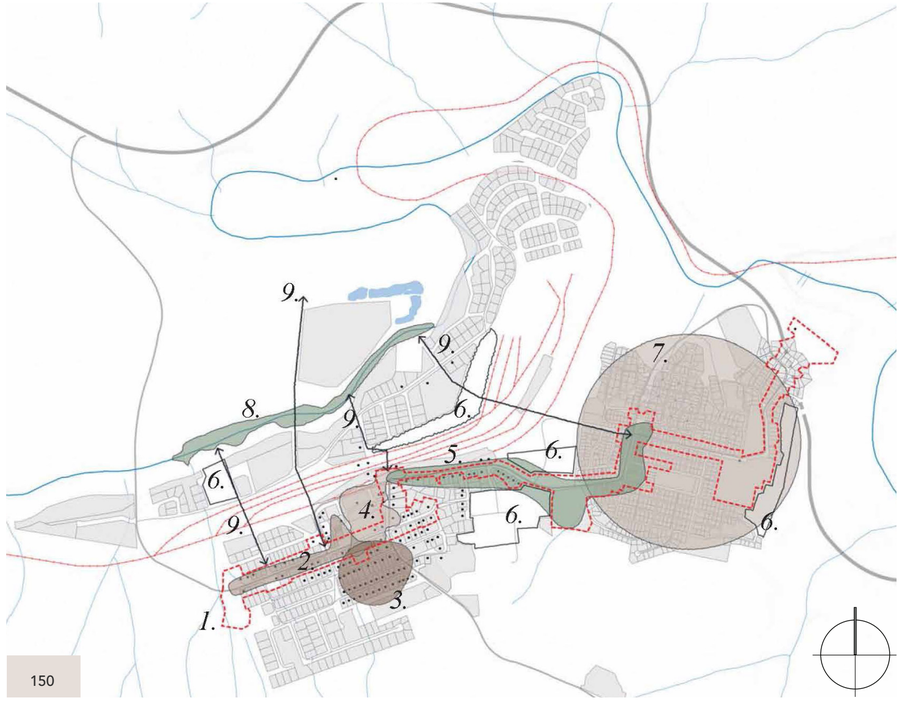

Fig. 150 *Macro-scale urban vision (Author, 2018)*

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7.3.2 Temporary urbanism – strategies for place-making

The (re)making of place from an existing, once romantic place such as Waterval Boven will have to rely on those lost romances of place. In other words, the town in all its splendours, needs to be re-introduced to, first and foremost, the locals and enthusiasts and then to the potential visitor.

Events and or services that can provide an experience as a by-product can serve as a great tool for place-making.

1. Create the identity of "the street that tells stories" through branding, subtle signage and enhance way-finding devices

2. Encourage informal trade in the CBD as well as TBD as part of the streetscape and experience of place adding a new layer of identity into the town, however temporal

3. Exploit the charm and character of the village houses through for example establishing a community owned "displaced hotel" that takes advantage of the public space as part of the hotel experience

4. Redefine the town core as a recreational and institutional precinct – include the youth accommodating activities in that space

5. Enhance and improve the character of the street that links town to township by adding sculptural taxi and bus stops, recycling facilities, micro transport exchanges etc.

6. Encourage infill development through contextual "prototype" temporary homes that could accommodate students of the tourism college.

7. Improve township public environment to encourage township tourism

8. Reintroduce trout farms and couple fishing with recreational use of the river bank. Create more direct links to the water-scapes of the town

9. Create direct links to Eco-tourism areas from the "street"

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7.4 Meso scale vision - A line of sites -
The Industrial promenade through time

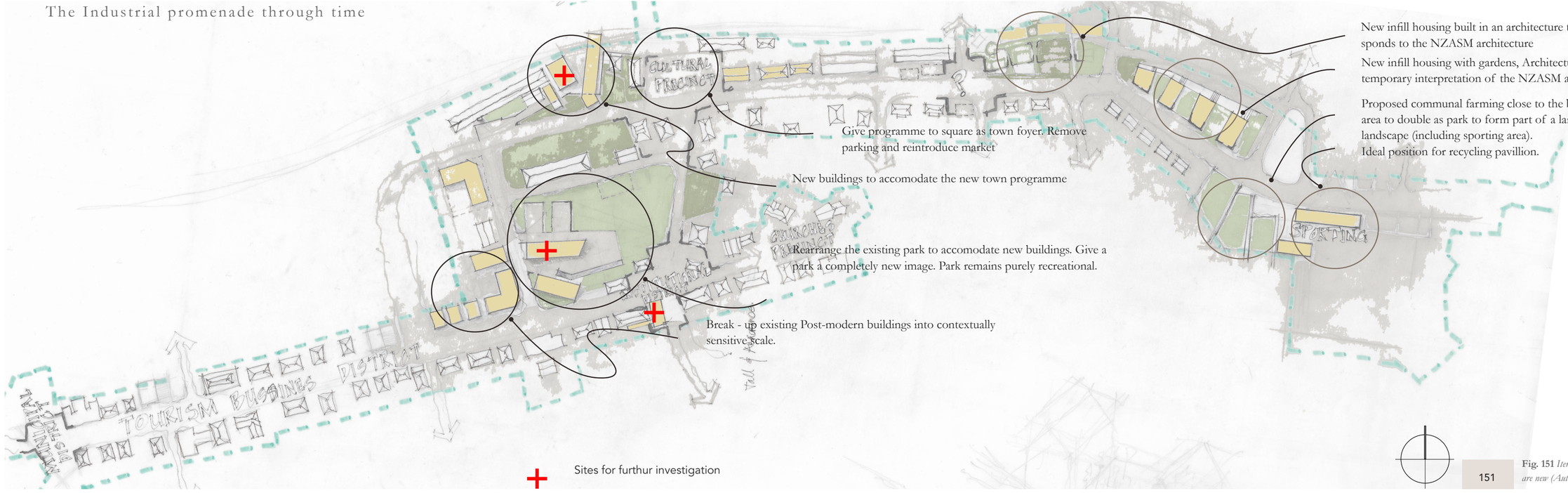

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Fig. 151 *Iteration 1 of meso scale vision. Objects shaded in yellow are new (Author, April 2018)*

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1. Proposed accommodation to Magistrates court to also serve as "gateway building" into the town.
2. Proposed affordible infill housing with new subsistance farming gardens for residents taking clues from NZASM typology.
3. Proposed temporary trading stalls installed to mimick existing historic houses for festivals and peak tourism seasons. New layer and identity into the old.
4. Proposed ancillary building to house recreational spaces like a theatre and offices for town steering committee.
5. Upgrade of local library to be more characteristic of community library.
6. NZASM shed to house town information centre run by tourism students of local college.
7. Convert house into clubhouse.
8. Reinterpret the park to mimick the towngrid, creating new vistas eg. library gets emphasis as public buildng.
9. Improve park with new memorial landscape with play areas.
10. Reintroduce greenhouse to facilitate recreation and productive landscape.
11. Refurbish functionary houses and covert to local museum.

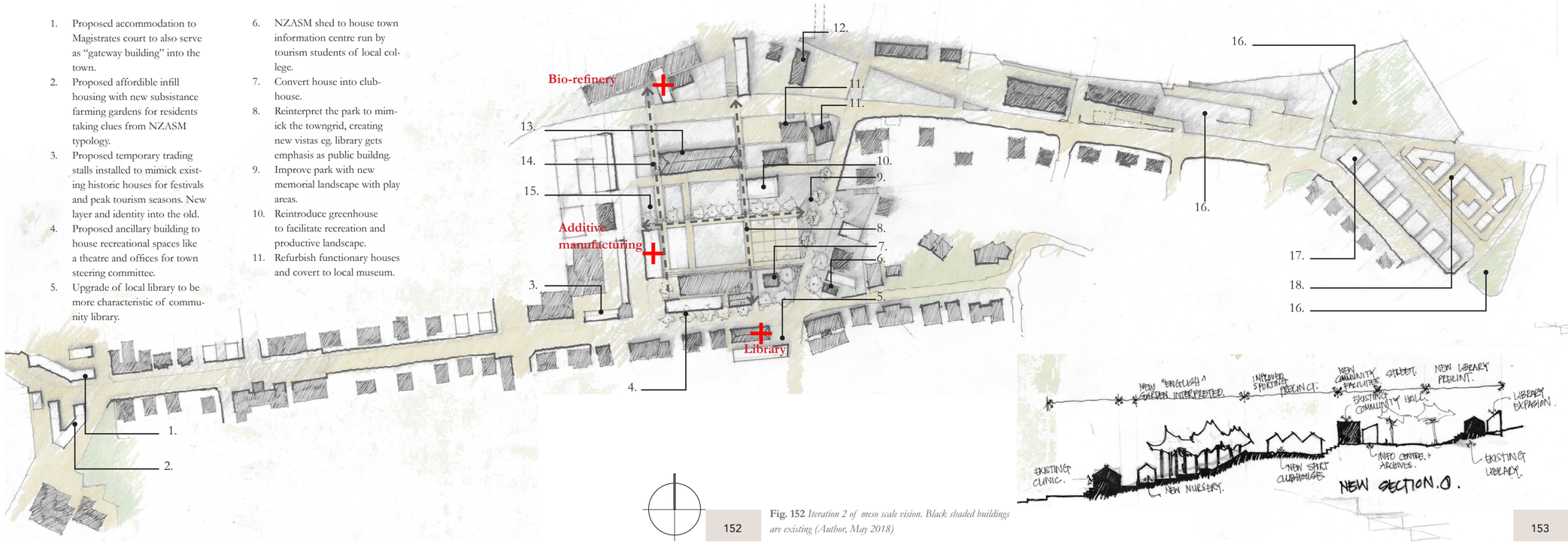

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Fig. 152 *Iteration 2 of meso scale vision. Black shaded buildings are existing (Author, May 2018)*

12. Convert Transnet laundromat to house local radio station continuing building's ontology of communication.
13. Maintain as local clinic
14. Proposed route for pedeastrians and for moving goods on bicycle or foot.
15. Proposed square to service retail from printing building and to frame old building across the road.
16. Proposed communal farming
17. Proposed infill 2 storey housing in reference to old buildings.
18. Proposed infill housing to respond appropriately to contet but does not have to mimick the old.

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Fig. 153 *Conceptual section (Author, May 2018)*

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7.3.1 Agricultural Urbanism – In memory of the omnipresent industrial landscape

Part and parcel of any urban regenerative remodeling project should be an eco-systemic way of thinking about place which would encourage a thorough understanding of existing systems and networks, if any, or the identification of potential networks and systems (Peres, 2016). If Waterval Boven and its new industry are to thrive in a sustainable fashion then the industry, cultural processes and resources should be united through the common flow of natural resources (Peres, 2016).

A line of sites thus proposes new commons in the form of communal urban agriculture that will occupy the naturally irrigated areas along the promenade. Due to its harsh topography, this part of the landscape lent itself as the perfect buffer zone to separate the town from the township, exacerbated, of course, by the running of the power lines across this area, ensuring no building can occur here. Placing the agricultural commons in this area thus renders it a meeting place, through work or leisure between inhabitants of the town and those of the township.

Various starch based crops are to be grown by members of the community to be resold to neighbouring towns or locals and tourists. All organic waste emerging from the farming activity as well consumption activity can be sent to the bio-refinery plant for conversion into bio-plastics.

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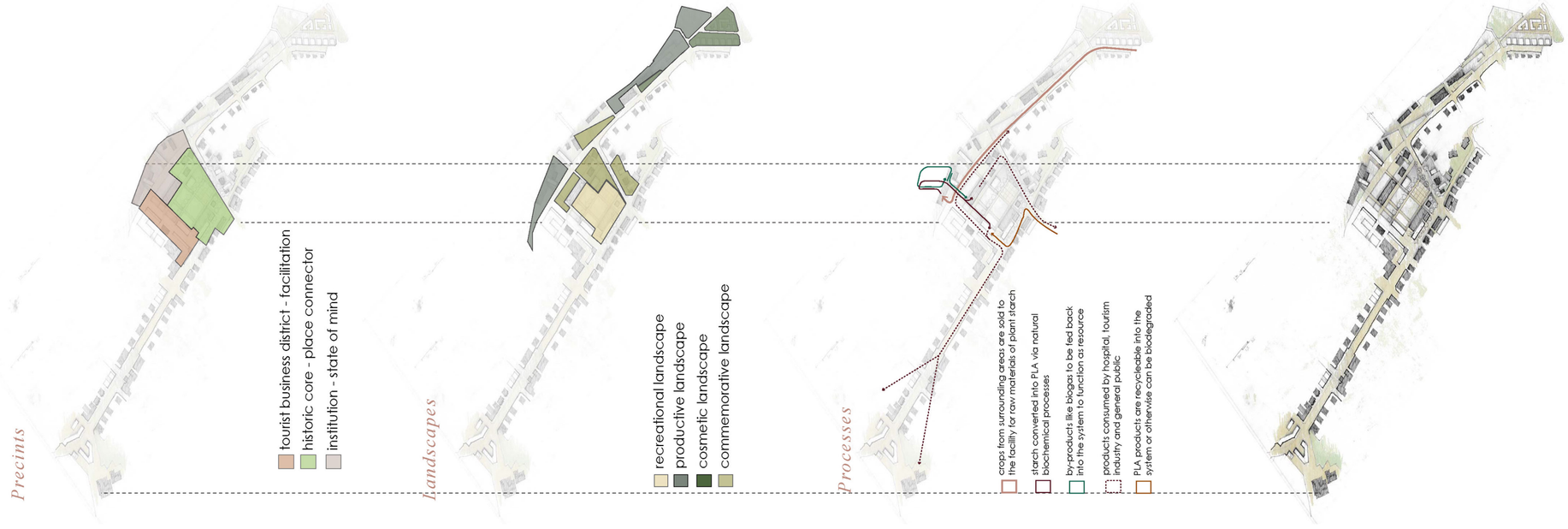
Fig. 154 *The industrial town vision. Product, process, landscape. (Author, June 2018)*



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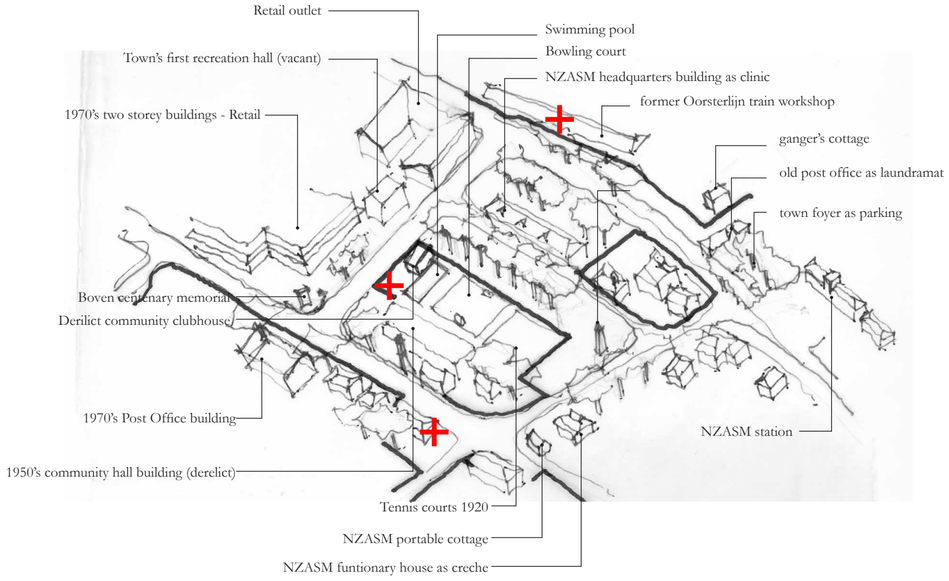
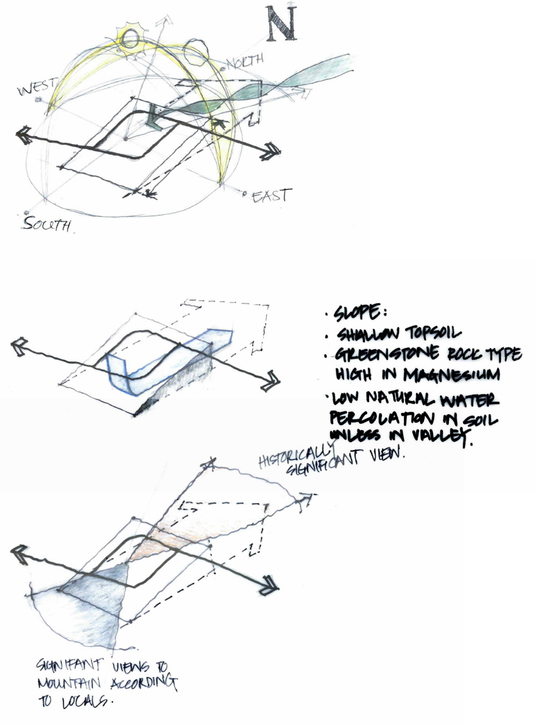
7.5 Waterval Boven Reboot* - Precinct vision

The dissertation proposes that the historical core of the town be declared a monument and protected as a significant whole area that exhibits cultural significance in terms of the its heritage built and landscape fabric, its setting, as well as significance thereof as a former service centre along the NZASM Eastern line; its use and related meaning in accordance to article 1 of the BURRA Charter (The BURRA Charter, 2013: 2).

*Title borrowed from the name given to the steering committee of the town established during the narrative workshop



155 **Fig. 155** *Existing historic core (Author, 2018)*



156 **Fig. 156** *Site analysis, climate and geography(Author, 2018)*

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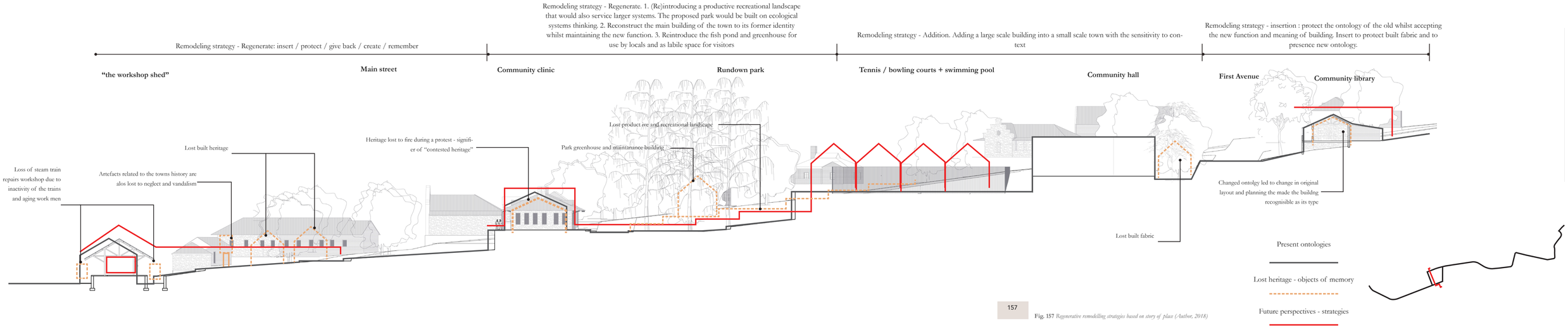

Fig. 157 *Regenerative remodelling strategies based on story of place (Author, 2018)*

The regenerative remodeling strategy is to conserve this area whilst transforming it into a living and working place of memory, to accentuate its recreational ontological history and turn it into a place of culture and opportunity for the locals; a nostalgic sanctuary for visitors and embed ecology as the glue binding the old fabric with the new industry. The strategy is multifaceted and multi-layered.

1. Restore character and charm of historic fabric: Reconstruct buildings and public space to a period that is accurately depictive of the height of the town, the NZASM period

2. Preserve open space system: These have garnered meaning over time and have become important as way-finding devices. These are generously placed for the augmentation of ecological systems to create a regenerative place.

3. Cut and fill strategy for insertion of new fabric to not disrupt the historic character of place.

4. Paths and platforms: Introduce paths for urban access and choice. Locals and visitors can use these to experience the productive and cultural landscapes as was intended by the original town plan. Paths also serve as ordering device for the subtle separation of programme in the park area. The grid of the paths contrast the organic paths of the original plan to support the form of the added recreational activities (swimming, tennis and bowling). These are seen as new layers onto what originally was – the new paths and platforms are the new addition to this palimpsest.

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Fig. 158 *Precint vision (Author, October 2018)*

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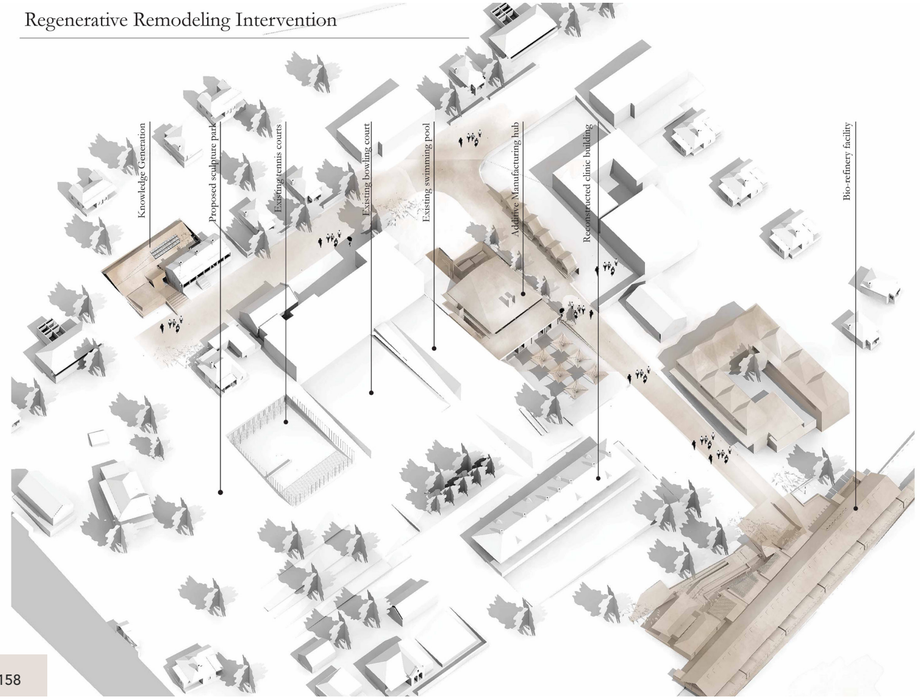

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Chapter 8
Design development

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Fig. 159 *Two tales of one town. Pictured is the NZASM locomotive about to pass what is seemingly a Nguni hut constructed with metal cladding. Is it an observation post held by an African labourer or the first "shack" in Waterval Boven? Nevertheless it is an interesting photo of contrasting/merging technologies and cultures (Boven se Storie in Beeld en Woord, 2001)*

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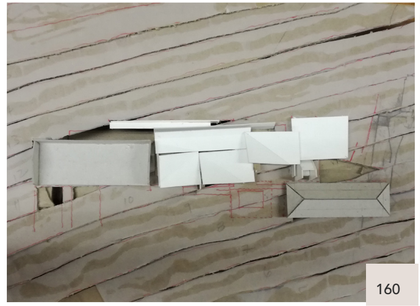
Iteration 1

General form exploration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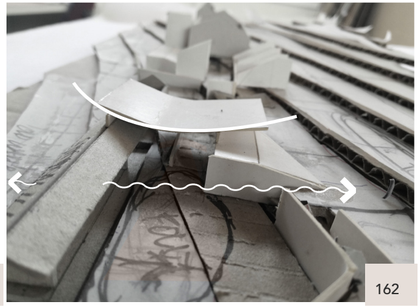
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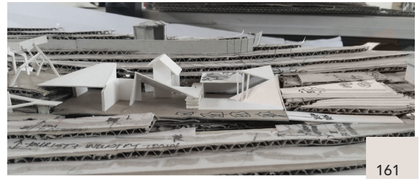
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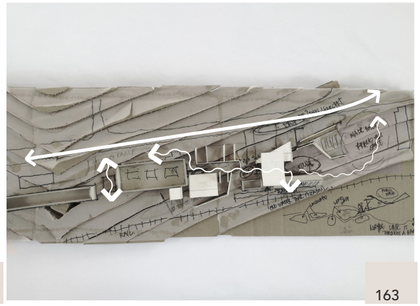
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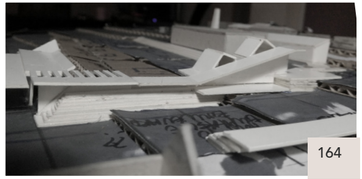
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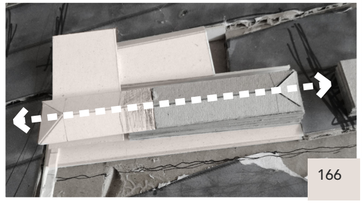
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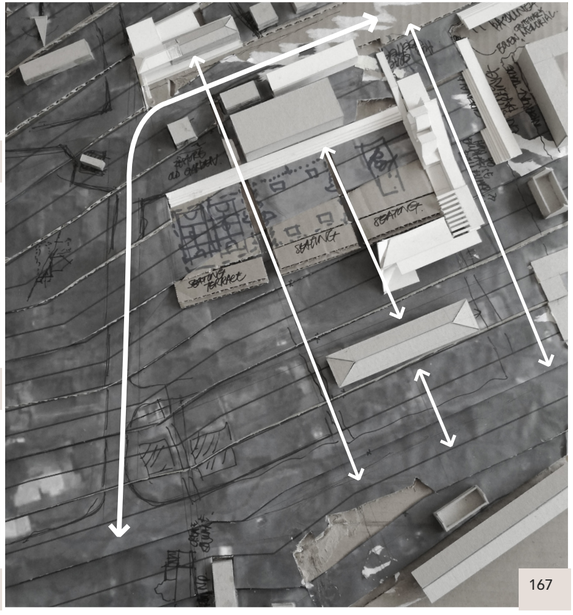
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Fig. 160 *First exploration of the appropriate scale and formal insertion into the town (Author, March 2018)*
Fig. 161 *Exploration of a the intervention on a site closer to the town station (Author, March 2018)*
Fig. 162 *How new could presence and protect the old. Explorations at the town station as site choice (Author, April 2018)*
Fig. 163 *How new could presence and protect the old. Explorations at the town station as site choice (Author, April 2018)*
Fig. 164 *First iteration of the additive manufacturing hub (Author, April 2018)*
Fig. 165 *First iteration of the library addition (Author, April 2018)*
Fig. 166 *First iteration of library - a mimic approach was explored (Author, April 2018)*
Fig. 167 *First exploration of the programme in the context of the town (Author, April 2018)*

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8.1 Introduction

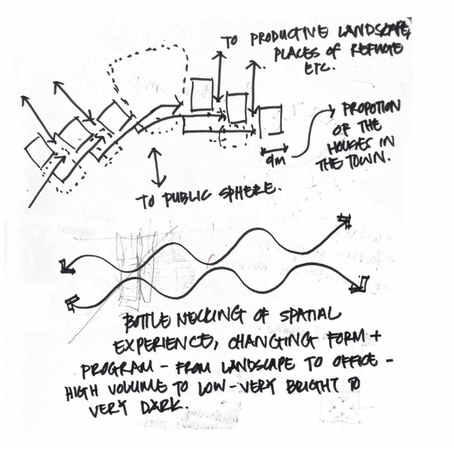
Any design intervention that occurs out of the theoretical framework of regenerative re-modeling has the responsibility to, first and foremost, attach itself to the tectonic history of place (Moore, 2007). As concluded in the Story of place chapter, each epoch in the history of the town embedded onto this landscape an architecture that was rooted in place, experientially; responsive to current technology in scale, form and programme and finally created a topographical continuum where the ability and possibility for the landscape to continually present itself as a resource was preserved.

The exploration of an appropriate architectural language for Waterval Boven thus relied on these informants: experience; scale, scenery, and form; programmatic requirements and a topographical continuum.

8.2 Design infuences

8.2.1 Experience

Waterval Boven's story of place illustrates the ever connected relationship between the objects, read buildings and industry, and the landscape in which they're situated. The relationship of houses to important buildings and places being arranged through company ranking, for example, is evidence of an industry entrenched in place, where one's experience of place occurs concurrently and even at the same hierarchical level as the built articulation of the industry that is responsible for the town's existence. The building(s) should, in their manifestation, present a continuum of this making of architecture where users and visitors can experience, tacitly or expressly, the everydayness of the industry that the building, and by extension the town, represent.



168 **Fig. 168** *Experience diagram (Author, 2018)*

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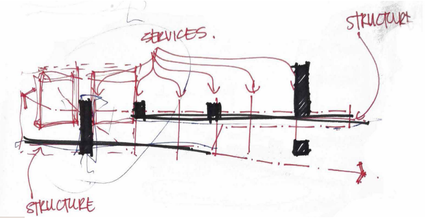
169 **Fig. 169** *Scale, form and scenery (Author, 2018)*

8.2.2 Scale, form & scenery

The historic core presents a legible sensitive scale to the visitor. The old buildings, however different in typology, maintain a specific language in scale and form. This, of course, is a causal effect of a building code that has its origin in a country whose architecture was based on a medieval façade based proportioning system. More importantly, was the fact that most of the timber used for the construction of the roofs had to be imported meant that the sizes of the houses would naturally be based on the maximum size of a transportable timber members which in turn was determined by the size of the transportation medium, in those days, the train up to the station in the town and then by oxen up the slope to the relevant site.
In the making of a regenerative architecture, addressing not only the scale of the buildings but also the intangible heritage linked to these buildings, is imperative for a contextually appropriate remodeling exercise.



170 **Fig. 170** *Programme and services space plan concept (Author, 2018)*

8.2.3 Programme

Part of the act of remodeling is the making of an intervention that is eloquent in the architectural language of the period in which that particular intervention was made. Part of the issue leading to the small town's condition as witnessed in Waterval Boven is the lack of elasticity within the architectural language of the existing buildings. In other words, to quote an 1842 definition of resilience, the buildings are incapacitated to resume their original shape or position after compression (Peres, 2016). The design of the new buildings should preoccupy themselves with versatility and adaptability to create a resilient, regenerative architecture.

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171 **Fig. 171** *Topographical continuum diagram (Author, 2018)*

8.2.4 Topographical continuum

The topography is seen and read as a host to the ever changing landscape of the present, binding history and memory into the present day. As seen in the stone circles, topography is that which remains for future generations to continue the acts of those past. The mandate of topography to play as well as to house resources is part and parcel of what makes Waterval Boven a unique place.

The proposed architecture responds to the above informants through an interpretation of Brandt's shearing layers of architecture by (re) introducing, through interpretation, the three conditions of architecture in the town:

a) The architecture embeds the stereotomic, slow changing layers into the topography (object of landscape). The permanence of this layer implies a mark of technology in the landscape. This condition is a response to the notion of topography as resource thus at the end of the buildings life cycle a new building could emerge in its place, maintaining continuity of narrative and providing resilience.
b) Objects on the landscape address contextual responses as well as flexibility and come in the form of a stereotomic, infill architectural language. It is in this condition where materiality of the old and the new find harmony.
c) Objects above the landscape are used as contrasting elements. Whilst they may sensitive to context, their intention is to highlight the old through emphasizing it in their backdrop.

The three conditions find confluence in addressing programmatic and climatic responses. Whilst the conditions are a broad strategy applied to the three buildings, they are applied in different ways for each building depending on the conditions to which each building has to respond.

Introduction

The architectural intervention attempts to address, firstly, the issue of built heritage. The existing library is housed in a

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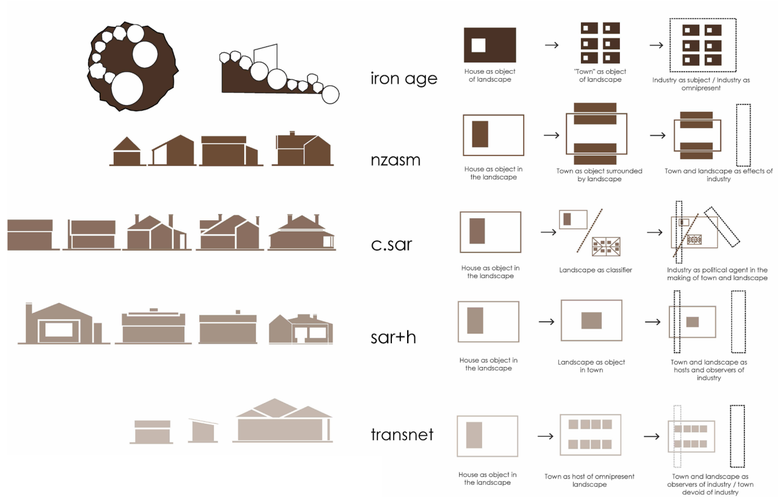

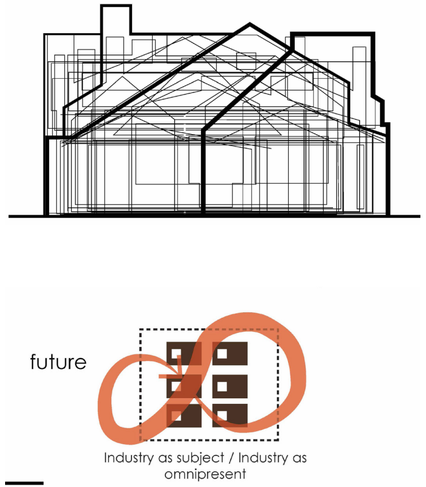

172 **Fig. 172** *Study of typological adaptation based on story of place (Author, 2018)*

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8.3 Site 1: Addition

former “single men’s” residential quarters built in 1895 which were subsequently converted to semi-detached “married quarters” in 1905 (Wasserfall, 1989, p. 230). Whilst some of these buildings were eventually converted into single-family bungalows over time, this building was converted into the local community library thereby changing its ontological narrative.

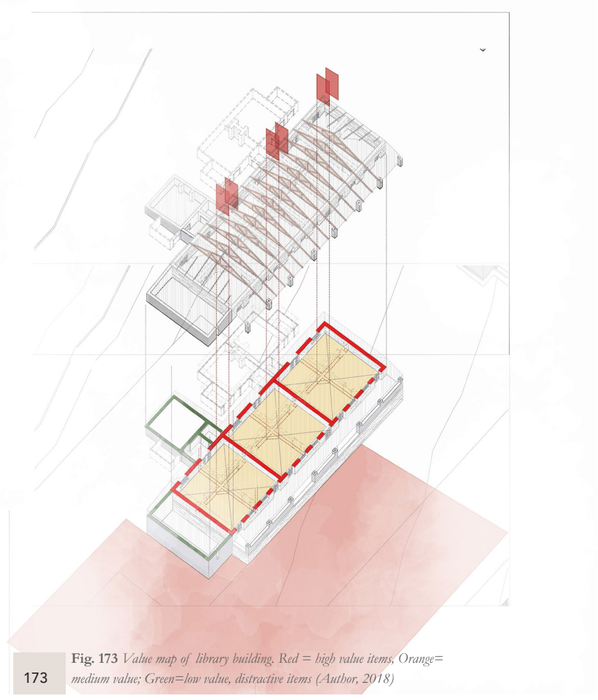
Heritage issues_ The issues attached to the latter conversions include the:

demolition of internal walls and fireplaces,

the alteration of the original façade treatment in terms of original doors and windows,
the addition and subtraction of service spaces and alteration of access into and out of the building.

All of these alterations have deteriorated the legibility of the original building rendering it almost unrecognisable to its type in the town. The BURRA charter advises that whilst alterations to a building which forms part of a larger group of similar buildings is not necessarily negative, this instance is unique in that it is the only one of its type still in custodianship of the local authority. Whilst this legal condition is partly the reason for its neglect and subsequent decay, it has protected the building from even more insensitive alterations made by unaware private owners, a fate that has befallen most of the other buildings of this type.

This makes this building a candidate for partial reconstruction based on interpretive conclusions drawn from the valuation map above.



173 **Fig. 173** *Value map of library building. Red = high value items; Orange= medium value; Green=low value, distractive items (Author, 2018)*

Building \ Values	age	historical	artistic	use	science	conflict	commemorative
site							
structure							
skin							
space plan							
services							
stuff							
story of place							

Article 15.4 of the BURRA charter (The BURRA Charter, 2013, p. 11) gives guidelines with respect to places that have been altered over various periods. The Charter suggests a careful interpretation of what fabric, use, association or meaning is more significant than the other in order to make an appropriate emphasis on the most significant, both historically and for present day narratives.

A less temporary strategy is thus applied in this intervention to propel the buildings ontology as a public library rather than a residential building. Of course this is done with an acknowledgment of the building being an object on the landscape. The intervention should thus blend in with the landscape or be of the landscape.

Statutory issues_

The building is illegible as a public building in its scale and articulation

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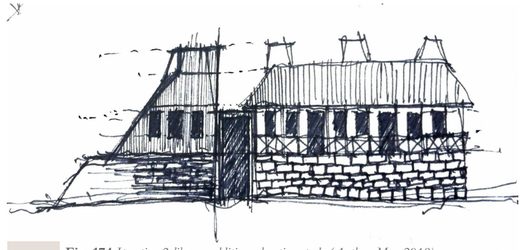
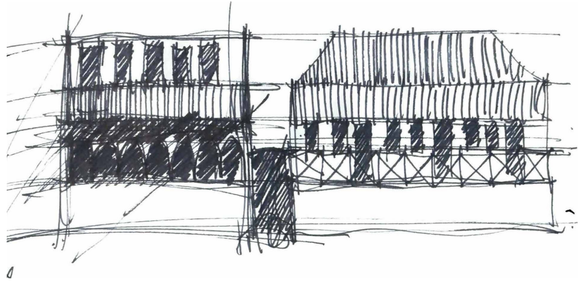
As a library servicing a much larger community than the one during its conversion, the building has become too small to accommodate the present community as well as projected population growth
Typical to small towns, the community has a large number of elderly, and by extension, mobility impaired persons which the building in its current state does not accommodate
The library building is also inadequate in providing the services for a building of its typology in terms of supporting programmes e.g librarians office, material delivery areas among other auxiliary programmes
The building also needs to be updated to meet the demands of a 21st century library
The building is dismal when it comes to fire regulations for a public building

Introduction

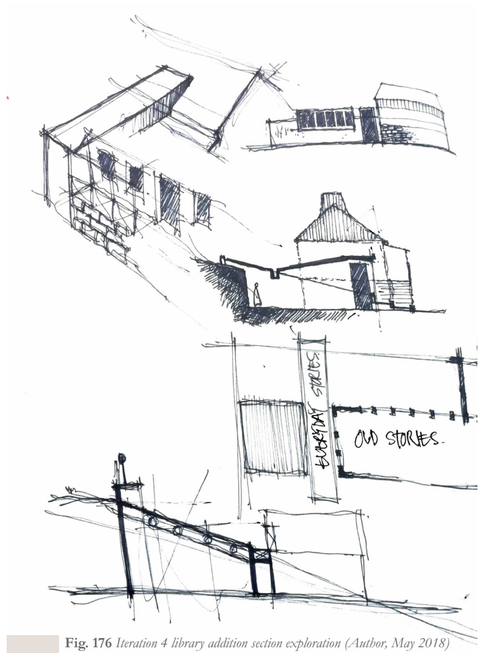
To remodel is to rewrite. Machado asserts that the act of remodeling is to create an architectural work as text that is characterized by the juxtaposition and co-presence of other existing texts and



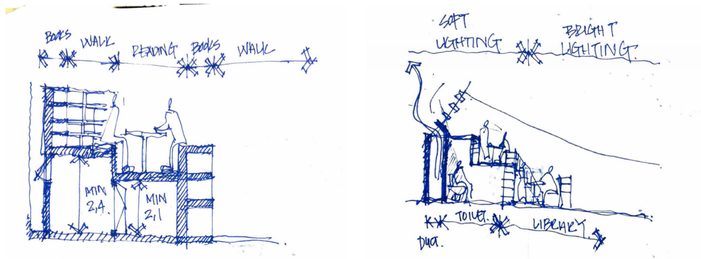
174 Fig. 174 *Iteration 2 library addition. elevation study (Author, May 2018)*



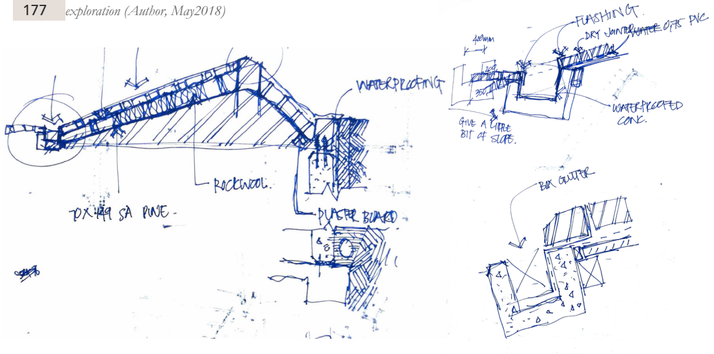
175 Fig. 175 *Iteration 3 library addition facade study (Author, May 2018)*



176 Fig. 176 *Iteration 4 library addition section exploration (Author, May 2018)*



177 Fig. 177 *Iteration 4 library addition internal spatial arrangement and seating exploration (Author, May2018)*



178 Fig. 178 *Iteration 4 library addition initial detail explorations(Author, May 2018)*

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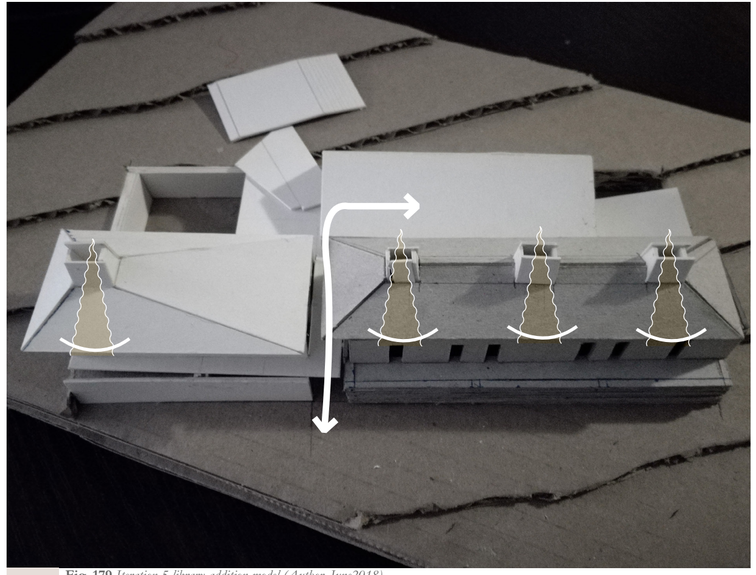
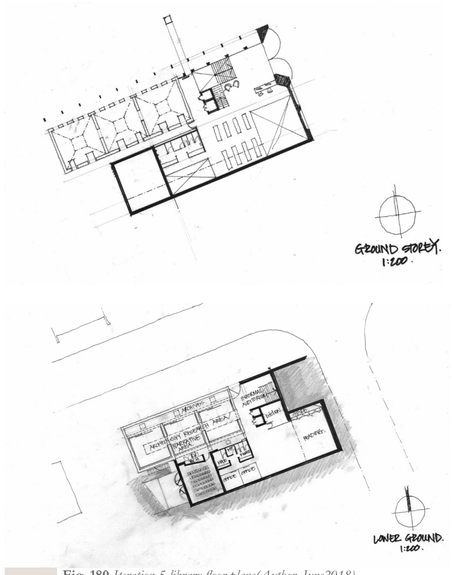


179 Fig. 179 *Iteration 5 library addition model (Author, June2018)*



180 Fig. 180 *Iteration 5 library floor plans(Author, June2018)*

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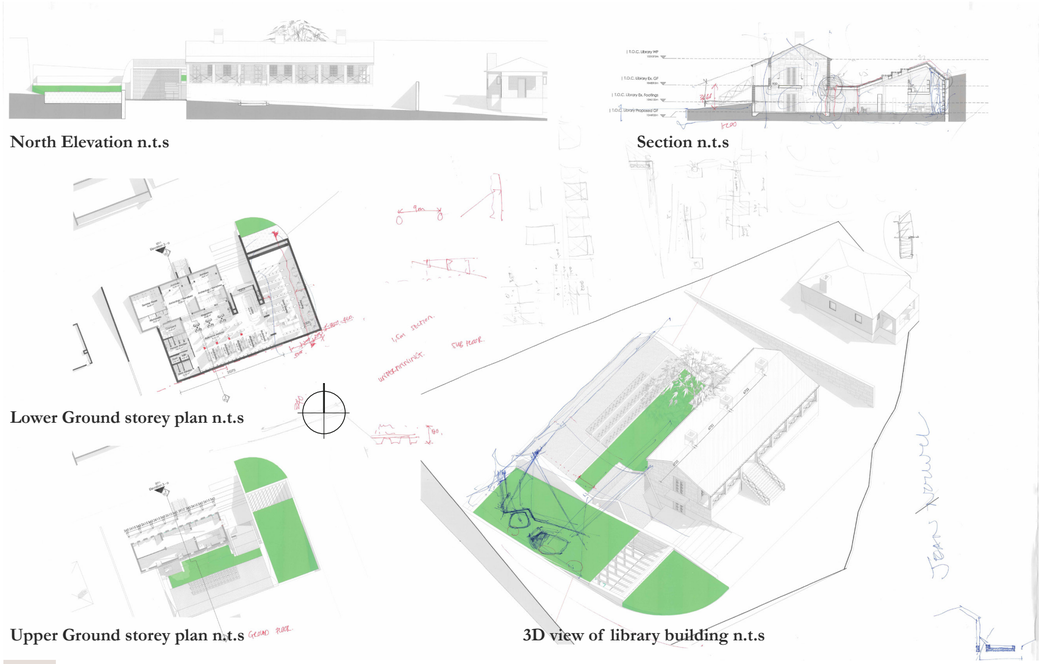

181 Fig. 181 *Iteration 6 library floor plans(Author, September 2018)*

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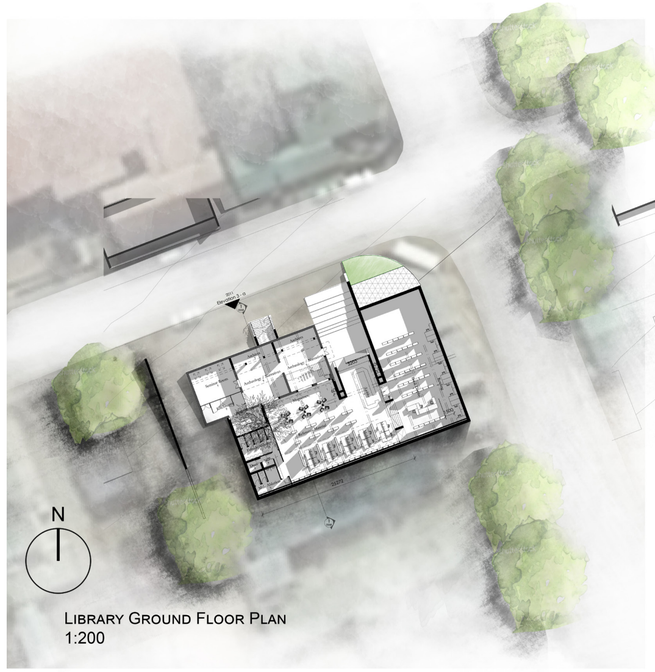
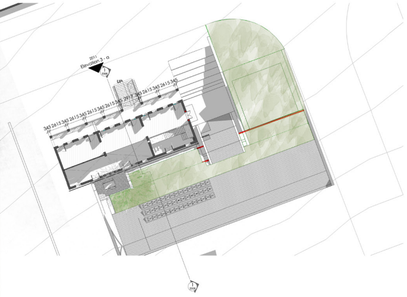


Library Ground Floor Plan
1:200



Library First Floor Plan
1:200

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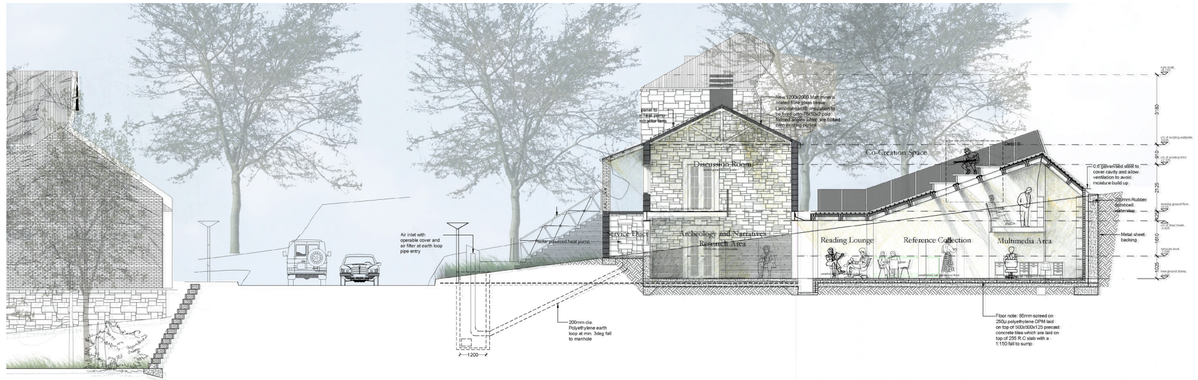
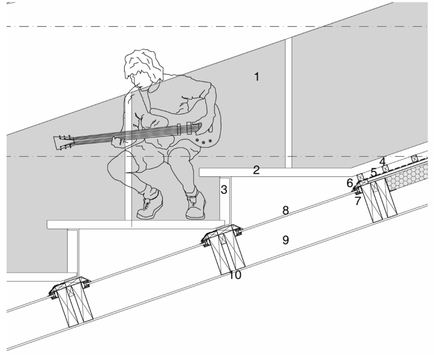
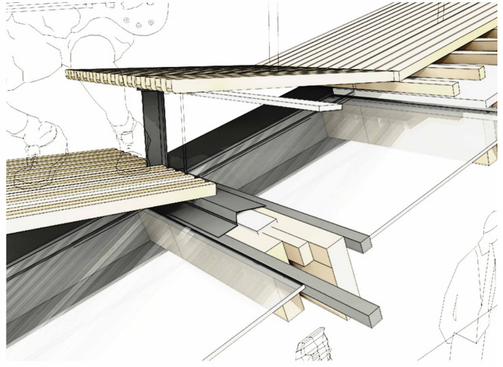




1. Balustrade note: Toughened glass panes bolted to T-profiled stainless steel posts on 50x50 stainless steel base plate bolted to roof surface. Balustrade to be min. 1000mm in height from adjacent floor level as per SANS 10400 Part-P
2. 63x35 CCA impregnated SA-pine timber deck come seat. Timber to be spaced at 45mm CL to allow for adequate light. class SA-pine timber purlins at 210 CL.
3. T-Profiled stainless steel support
4. 63x35 CCA impregnated SA-pine timber deck come seat. Timber to be spaced at 45mm CL to allow for adequate light. to be screwed onto 38x38 H3 preservation class SA-pine timber purlins at 210 CL
5. 25x2500x2500 Plywood sheet to receive blow torch waterproofing.
6. Timber filler piece over aluminium window frame to continue waterproofing.
7. Structural sealant .
8. Crealco Edge Thermal break casement window. Glazing to 6.38mm Low E safety glass. Light, ventilation and glazing to comply with SANS 10400 - Part N.
9. 305x165x41 Steel beams at 3000CL to form building primary structure.
10. 270x70 (x2) timber glulam beam with 38x38 timber spacer composite rafter fixed to steel I beams.

50x50 timber sp
fixed to steel I b



Detail 6, library skylight_1:10

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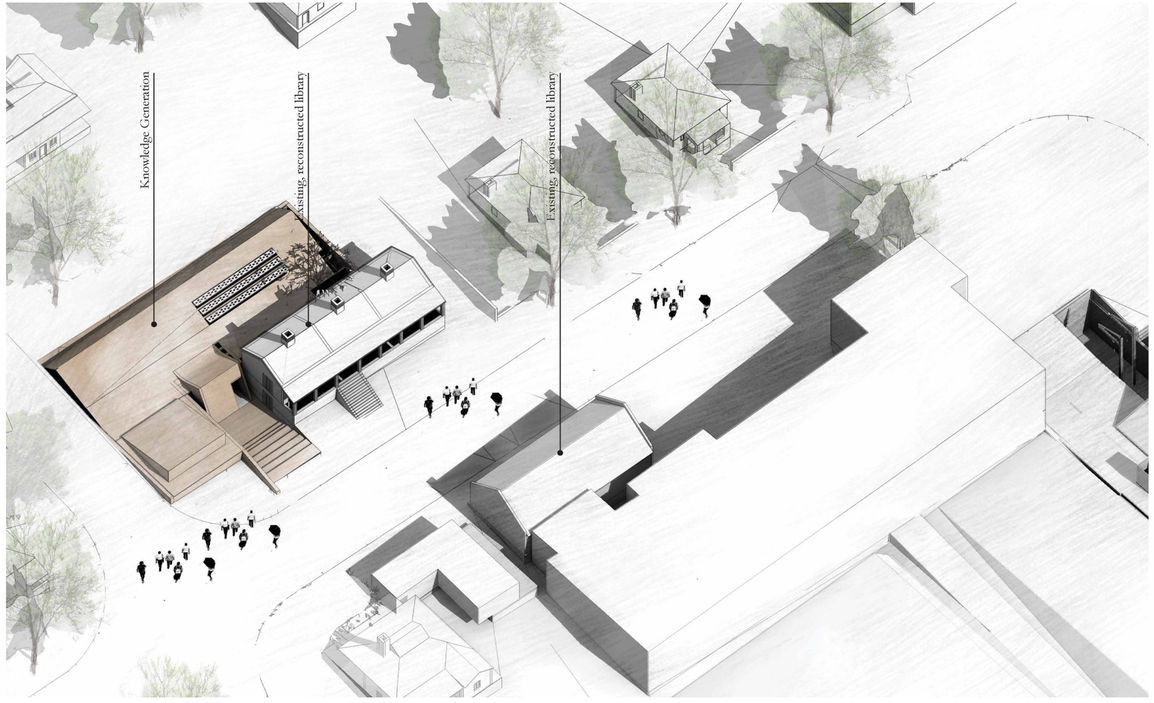

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8.4 Site 2: Insertion

that the existing, because of its age and its history, takes precedent and should be read as a material (Machado, 1976: 46). This building is situated in the upgraded commercial avenue of the town (in the context of the urban vision), where there it is least sensitive to develop.

Although it is not a mode of remodeling of built fabric, it is an insertion into a cultural landscape, in the literal sense of the word, in the town and therefore carries the responsibility of subtlety in response to this condition.

The buildings programme is an additive manufacturing facility, a 3D printing factory, to be used by the community as a resource for income generation and partial consumption of the local products manufactured here. The building will thus double as a culture hub, considering its location in the cultural precinct of the town.

In form, the building is a composition of a series of geometrically platonic forms: a long rectangle that houses the back-of-house spaces like the changing and cleaning rooms as well as the cold storage that is required to house filament that is still to be used.

The rectangle is then merged with a series of triangular maker spaces. The form is a direct response to the west facing front of this part of the building. In other words the facade is a peeling of the original rectangle, thereby staggering the elevation,

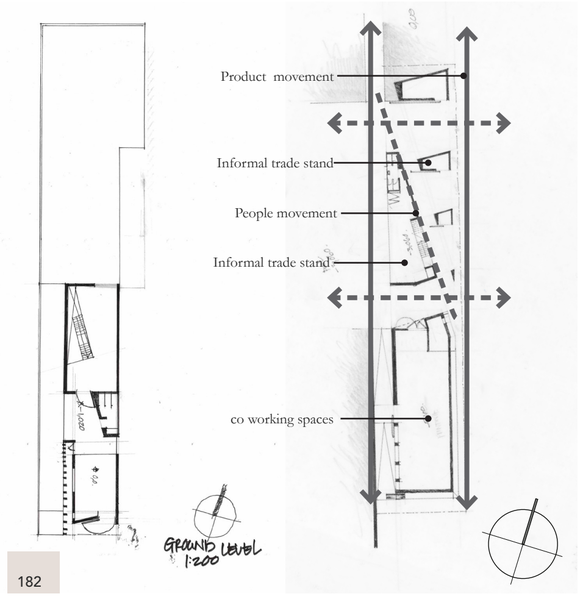
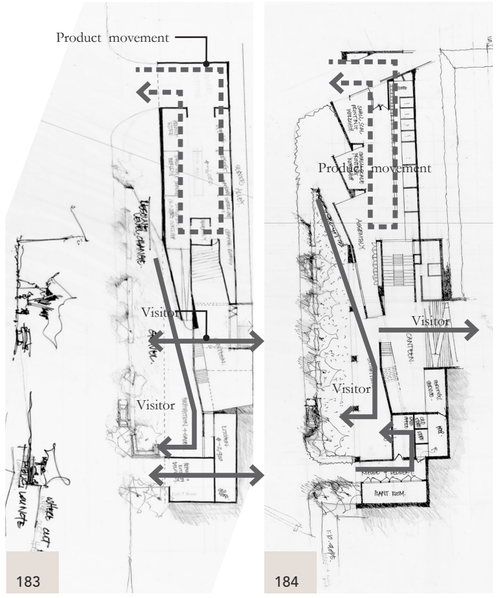
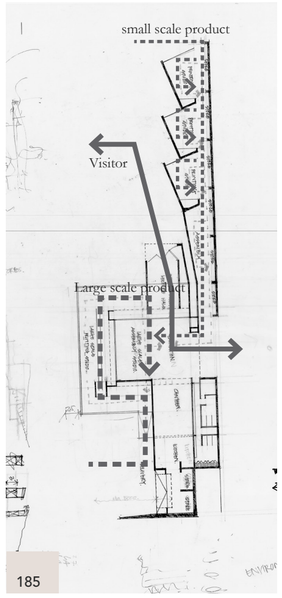


Fig. 182 *Additive manufacturing building, iteration 1 (Author, June 2018)*





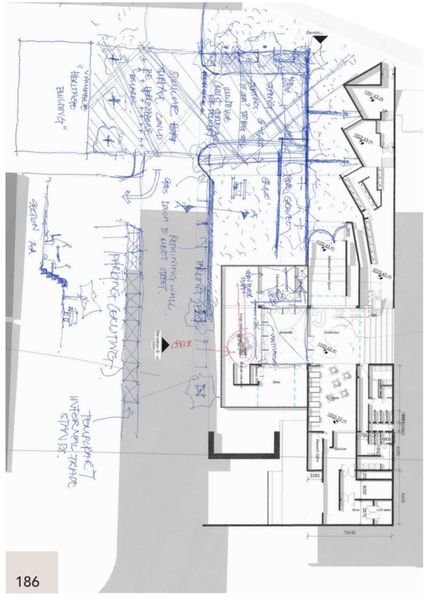


Fig. 183 *Additive manufacturing building, iteration 2 (Author, July 2018)*
Fig. 184 *Additive manufacturing building, iteration 3 (Author, August 2018)*
Fig. 185 *Additive manufacturing building, iteration 4 (Author, August 2018)*
Fig. 186 *Additive manufacturing building, iteration 5 (Author, September 2018)*

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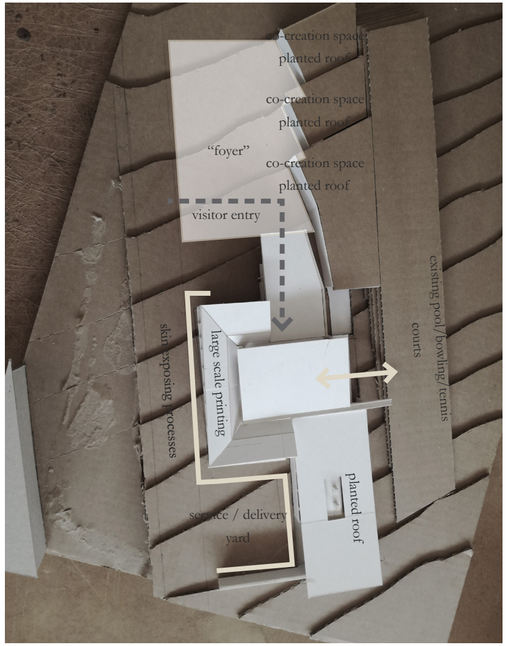
to allow for northern light to penetrate these spaces. Whilst on the ground plane these forms stagger upward following topography, the roof-scape maintains a uniform plane allowing the reintroduction of the topography that houses the recreational activities above.

The highest level of the building on ground storey in four meters below natural ground level. It is at this point where the building makes it presence out of the landscape to interact with the context. This expression comes in the form of a box that houses the large scale printing area, the canteen, kitchen, exhibition area and, in the attic space, the co-creation spaces which are accessible from natural ground. Fig. 187 illustrates the design process of the roof profile and its architectural, poetic as well as systemic intentions.

A new urban foyer is created in front of the building to create a positive urban response considering that the street elevation of the box is half submerged. The foyer is also a response to a significant building across the road which was the very first recreation hall of the town. The "foyer's" stuff are 1. the main entrance into the building, the anomalous form that doubles as a lecture hall during information session in gently attached to the box and 2.

The canopies made from extruded linseed oil sheets collect rainwater to be stored underneath the foyer and provides a shaded area for the programming of the space beneath.



187 **Fig. 187** *Iteration 5, urban response (Author, September 2018)*

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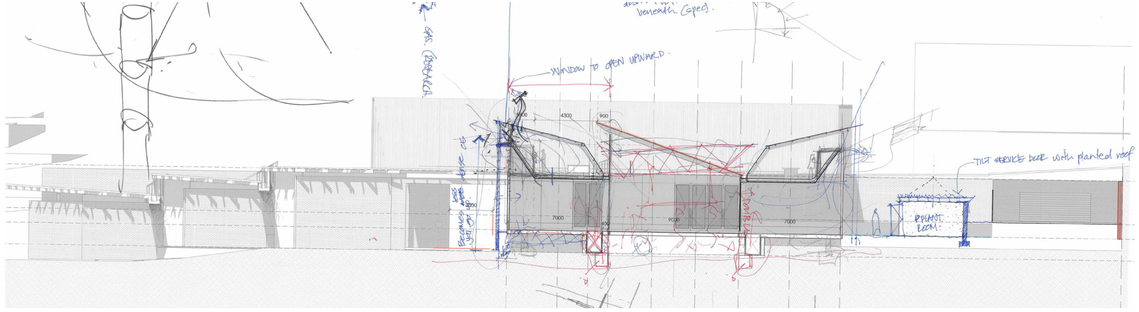
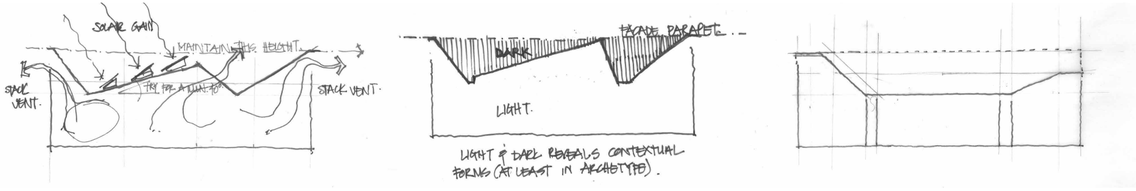


188 **Fig. 188** *Iteration 5, Sectional exploration (Author, September 2018)*



189 **Fig. 189** *Iteration 5, roof brief and exploration(Author, September 2018)*

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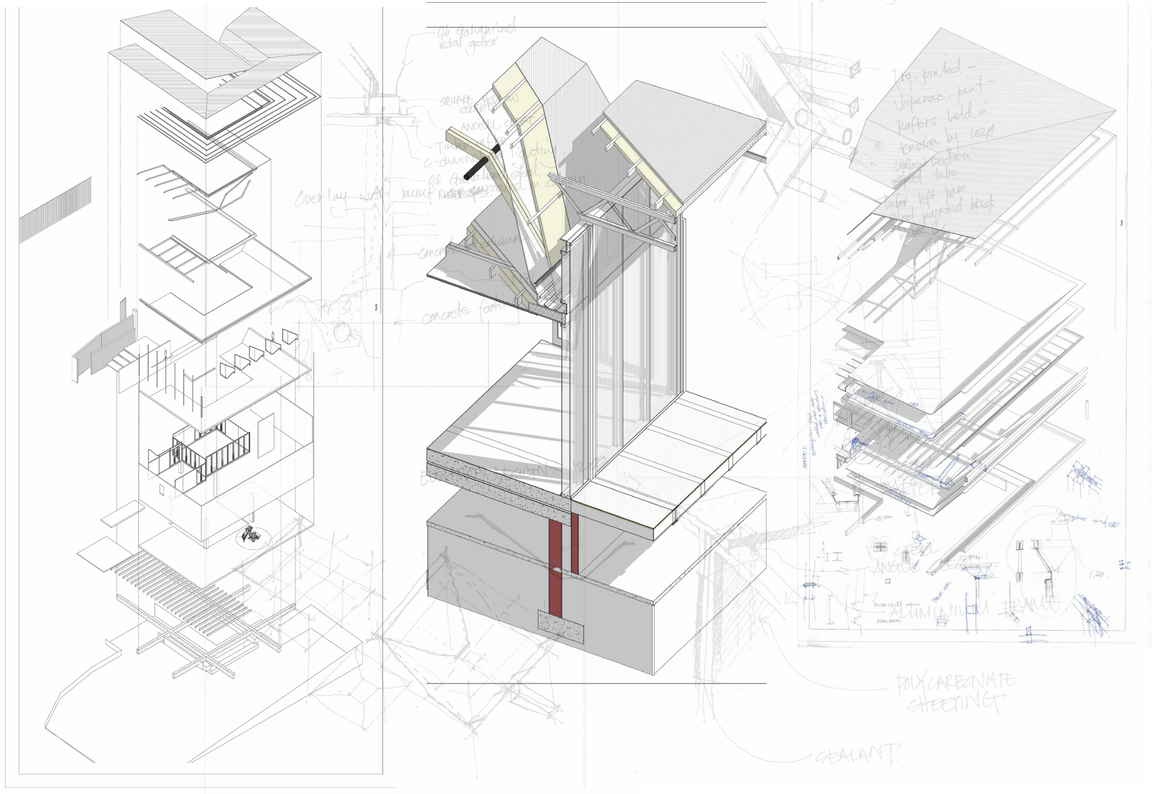

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ADDITIVE MANUFACTURING HUB FLOOR PLAN

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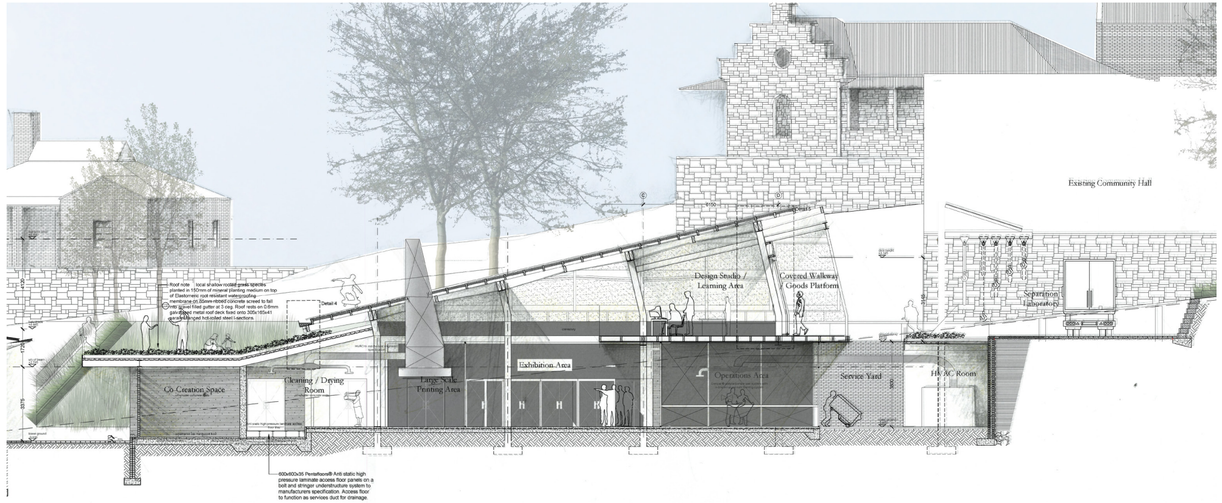

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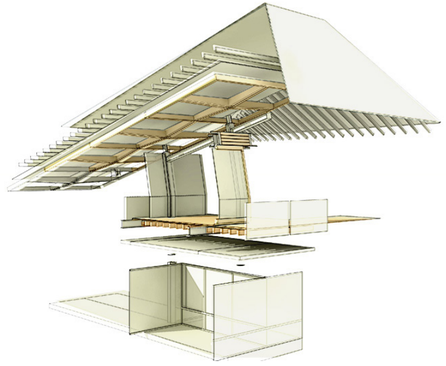
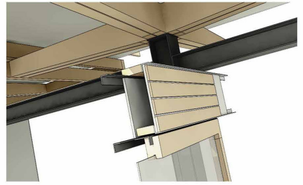
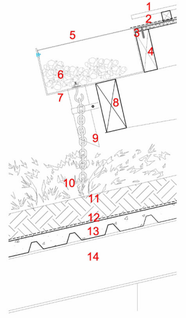
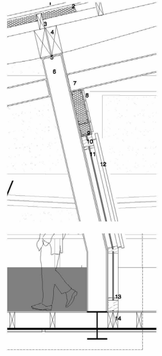






Detail 5 - Door_1:10



1. 22mmx110mmx3000mm CCA impregnated SA-pine timber deck to be screwed on 50x50 H3 preservation class SA-pine timber purlins.
2. 50x50 H3 Plywood sheet to receive blow torch waterproofing.
3. 230x70 SA-pine timber roof joist.100x200x100 Matt mineral coated fibre glass tissue Lambsleboard insulation fixed on 70x50x2 cold formed angles.
4. 144x422 Grade 10 laminated glulam timber beam to be bolted on steel node joint.
5. 14mm Thick purpose made steel node fixing to be bolted onto 305x305x97 hot rolled steel I section column.
6. 305x305x97 I section rolled steel column.
7. 305x165x41 parallel flanged hot-rolled steel I-sections.
8. 22x110x3000mm CCA impregnated SA-pine timber cladding bolted to 150x75x20x2 cold formed steel C-sections with Rockwool insulation and 15mm plasterboard baking to be lime plastered and painted.
9. Aluminium T-profile to door guide.
10. 10mm Thick glass door panel.
11. Toughened glass door panel.
12. Screw on aluminium handrail.
13. 100x190 SA-Pine bottom rail on aluminium rail screwed onto timber floor joist.

1. 22mmx110mmx3000mm CCA impregnated SA-pine timber deck to be screwed onto timber purlins.
2. 50x50 H3 preservation class SA-pine timber purlins.
3. 50x50 H3 Plywood sheet to receive blow torch waterproofing.
4. 230x70 SA-pine timber roof joist.
5. 2mm Anodised cold formed steel fixing strap to be bolted onto steel gutter and on timber joist.
6. Medium grain gravel.
7. 4mm Prefabricated hot rolled steel gutter bolted to joist.
8. 114x279 Laminated glulam timber frame for roof structure.
9. 110mm dia. anodised steel downpipe welded to steel gutter.
10. Local shallow rooted grass species
11. 150mm of mineral planting medium
12. Elastomeric root resistant waterproofing membrane
13. 85mm ribbed concrete screed to fall into gravel filled gutter at 3 deg. Roof rests on 0.6mm galvanised metal roof deck
14. 305x165x41 parallel flanged hot-rolled steel I-sections.

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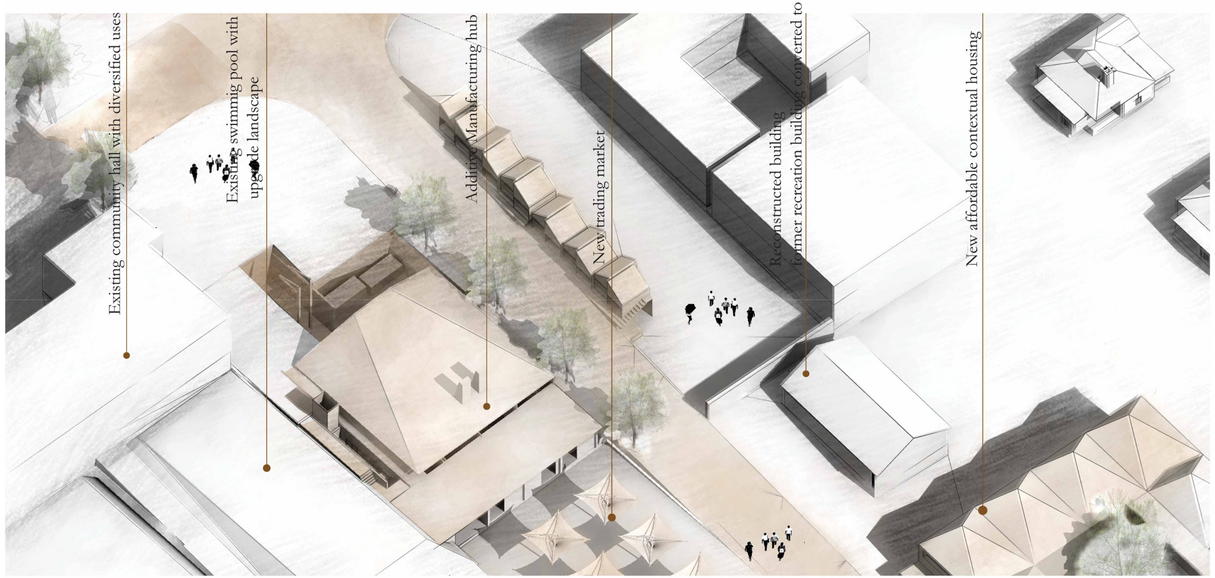

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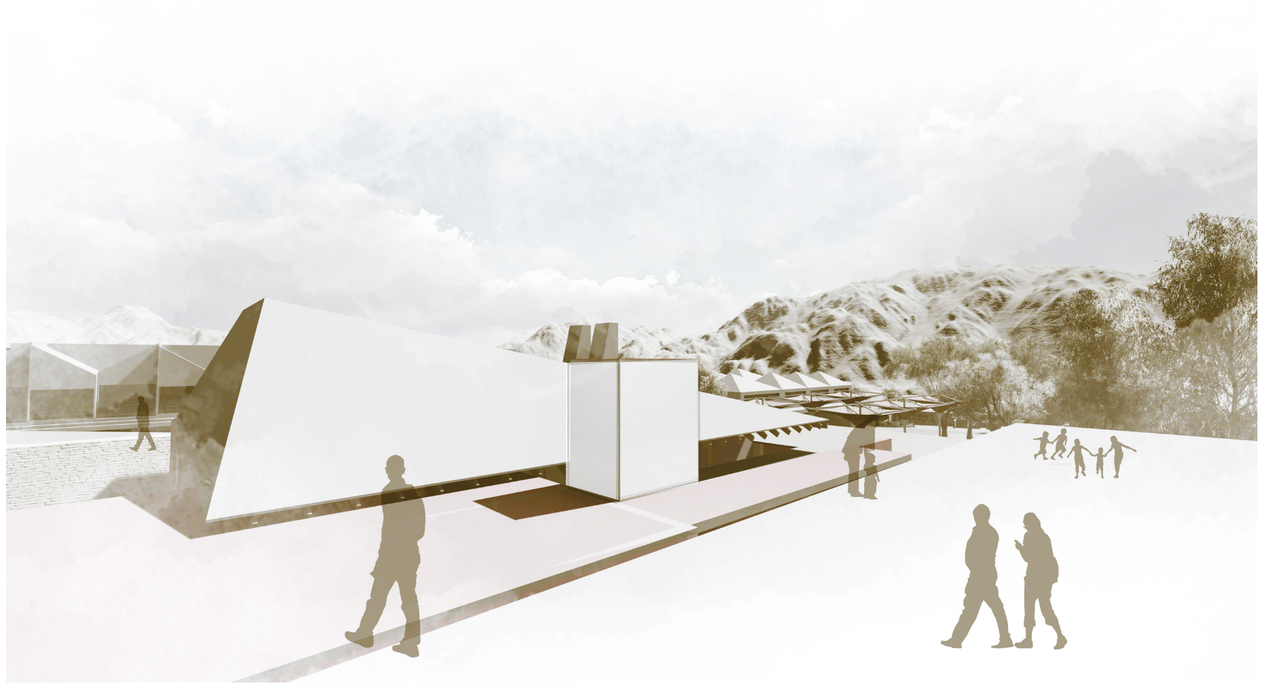

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8.4 Site 3: Adaptation/ Architecturalizing the industrial

Introduction

The third site is an act of adaptation. An architecturalization, to borrow Machado's terminology (Machado, 1976, p. 49), of a building that wasn't conceived in an obviously "architectural language" in relation to the other buildings in the town. Machado distinguishes buildings such as "the shed" through emphasizing the fact that they were conceived from a different set of criteria in relation to the otherwise "heritage significant" buildings in the town.

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190 **Fig. 190** *"the shed" value map (Author, 2018)*

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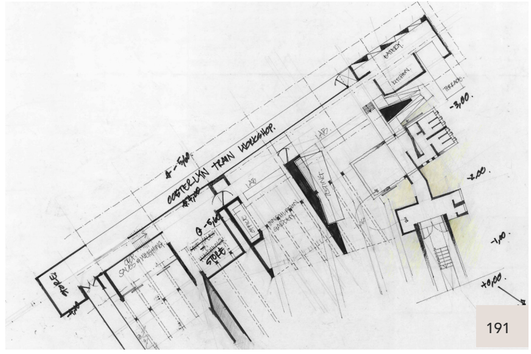
Unlike the other buildings, the shed is not loaded with meaning and sentiment. Apart from the components that make-up its tectonics - the railway sleepers of the NZASM that make up the structure and the metal sheeting recycled from other NZASM temporary structures – the shed is not imbued with significance to the narrative of the NZASM's Waterval Boven. It is however significant to a community that maintained the NZASM as well as SAR steam trains that operated for tourism purposes which ceased in 2015. Here the copper and brass components of the trains would be cleaned, the timber sanded and varnished and windows kept crystal clear. The building's significance is thus founded on meaning and use.

Fig. 191 *"the shed" bio-refinery iteretaion 1_Ground floor plan (Author, June 2018)*
Fig. 192 *Bio-refinery iteration 1_model (Author, June 2018)*
Fig. 193 *Section exploring the potential relationship between the landscape and the processes of the building, iteration 1 (Author, June 2018)*
Fig. 194 *Iteration 2, refining the bio-refinery process into the architecture and the landscape (Author, August 2018)*
Fig. 195 *Iteration 3, bio-refinery (Author, September 2018)*
Fig. 196 *Iteration 4, bio-refinery (Author, September 2018)*



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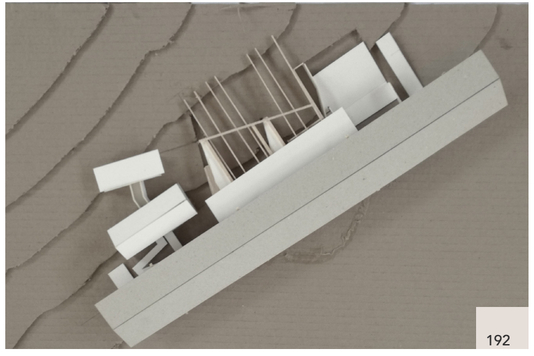
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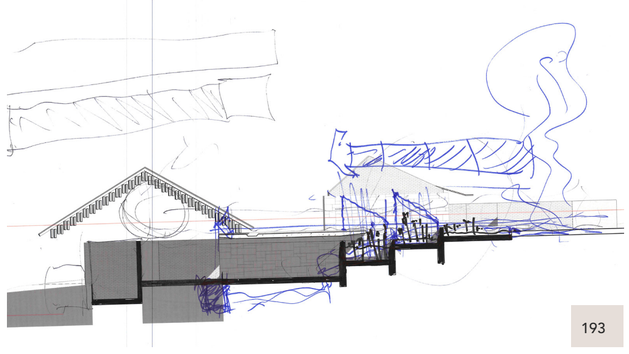
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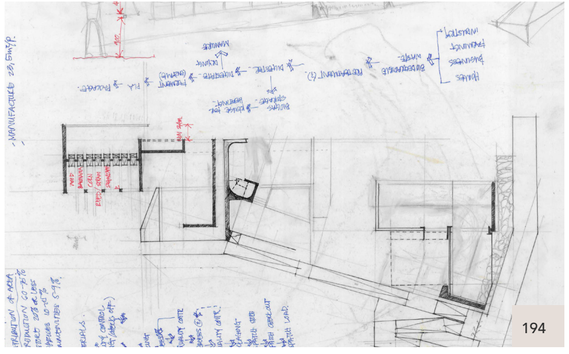
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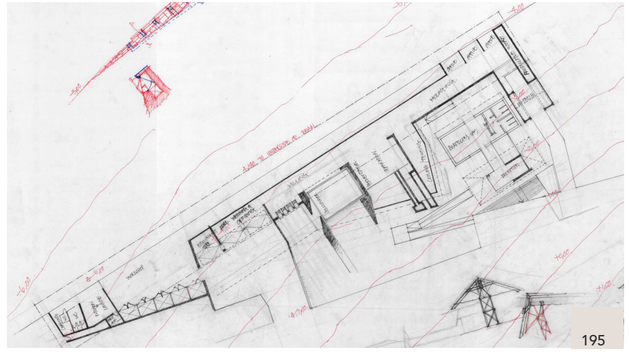
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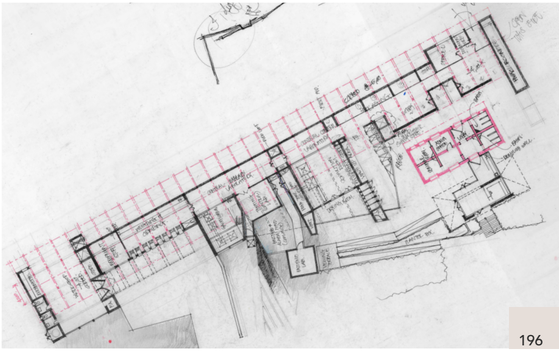
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The architectural intervention here is as a result of the existing form, materials and processes of the new programme. The design embeds the new intervention in the landscape, maintaining the view of the aging roof to the passer-by on the road above.

The architecture takes its cues from the architecture of the stone circles where topography and topographical resource systems were articulated through stereotomic, slow changing elements, and the shelter was a temporal tectonic, emphasizing the temporality of the inhabitant against the permanence of the habitat.

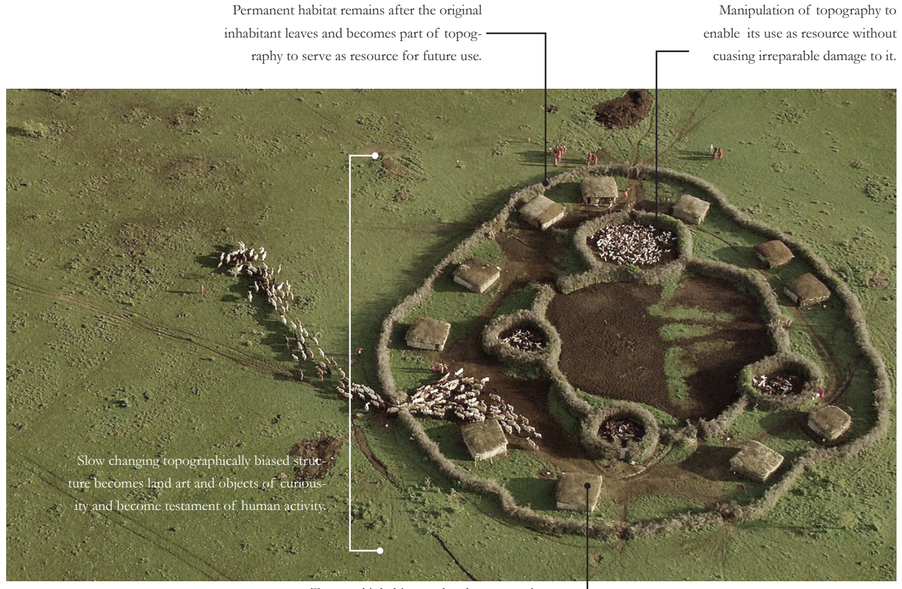

Fig. 197 *Masai homestead said to be similar to the typology of the Koni. Relationship between the permanent and impaermanent. (Google images, 2018)*

197

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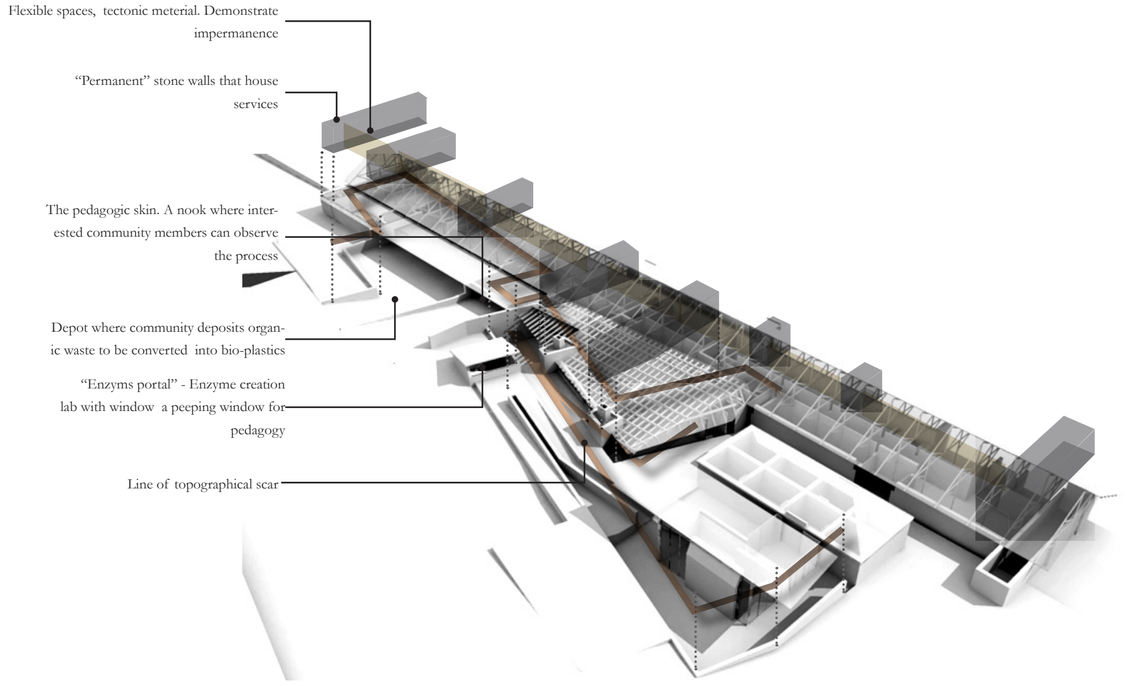

Fig. 198 *Iteeration 4_Illustration of a regenerative way of inhabiting the landscape (Author, 2018)*

198

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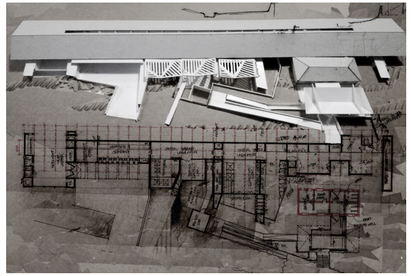
The programme is thus separated into served and service spaces in the building as well as in the landscape. The building is made through carving the topography to accommodate the new programme. The forms of this carving are references of the road above which echoes the general town grid as well as the conflicting angle at which the shed sits in relation to this grid. These lines were interpreted in a manner that alluded to an artistic form in the absence of the building in future.

In the carved space houses a series of pools which act as water storage, cooling agent for the processes and a pond for harvesting bacteria that is necessary for the chemical processes of the programme. The remaining carve out accommodates an area for the deposit of organic waste by community and industry.



Above the new carved out landscape, sits a series of stoned walls that project from beneath the existing shed into the landscape, irregularly spaced, they house all the services of the building, in other words, all things hazardous in relation the processes of the programme. This allows the nine meter space in between to house more flexible spaces i.e the various control and testing laboratories.

The flexible, non-permanent spaces are clad in timber framed linseed oil sheets, allowing for ample ambient light to penetrate the spaces and also their translucent quality turns the façade into a performance for the passer-by viewing the conversion of plant to plastic.

The stoned walls are covered with grassed roofs to blend in with the landscape above. This is to allow for a seamless, almost invisible integration of the walls into the landscape making the walls part of a resource topography.

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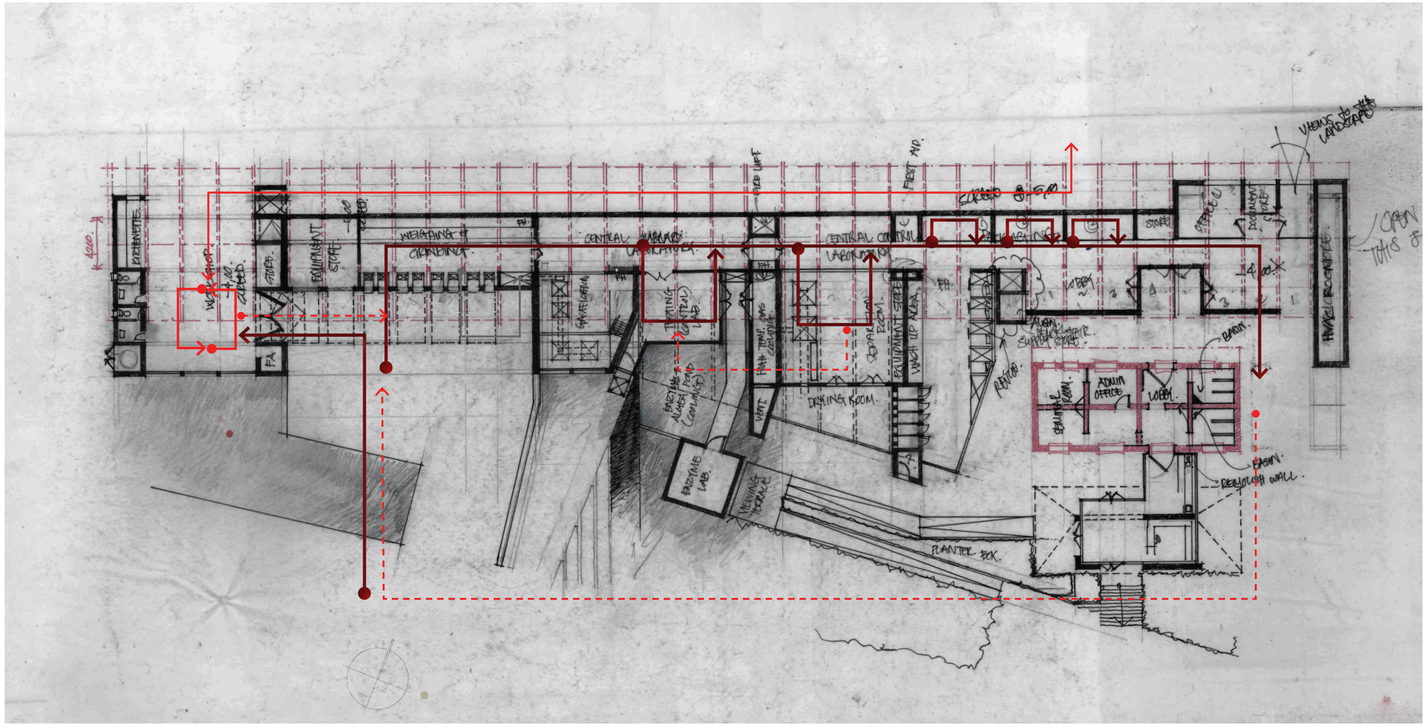

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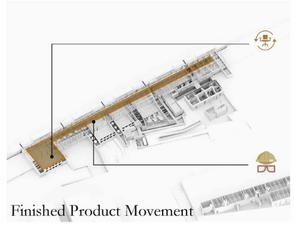
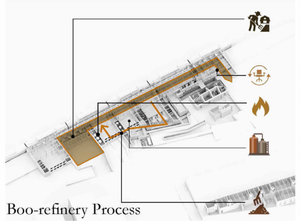


Finished Product Movement

Recycling / repair of train fitting and other products that can be repaired through manual labour.

Maintenance of trains (cosmetic): installation / removal of products into and out of the trains.



Boo-refinery Process

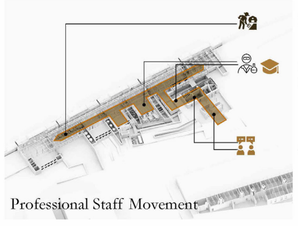
Milling of waste into refinable material. Pre-sorted waste deposited into sculptural deposit boxes.

Bio-plastic filament to consumer.

Biogas is by-product of Gasification used for assistive heating requirements.

Bio-refinery process yields by products like soaps and bioenegy sources.

Refined compost to be reprocessed or reused in the larger scheme

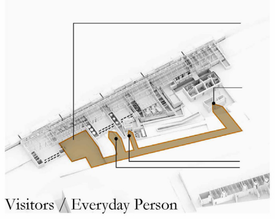


Professional Staff Movement

Milling staff, maintenance, cleaners

Doctors, students, academics in lounge spaces, labs and packaging areas.

Administrative staff

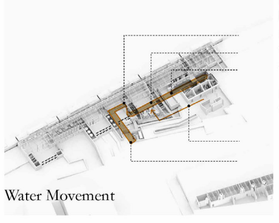


Visitors / Everyday Person

Waste depot and “deposit “ boxes

Visitor and information centre for bio refinery

Viewing pods and vistas pedagogy



Water Movement

Pool 1 - water storage to cool down hot lignin before high pressure cooling - steamy area.

Pool 2 - Subsurface flow wetland takes advantage of humid air and water to cultivate enzymes for catalysing biotech-processes.

Pool 3 - Water storage tank to store fresh water for reuse.

Rain water collected from roofs reticulated to water pools

Storm water runoff collection, filtered by soil and plants and stored in water pools.

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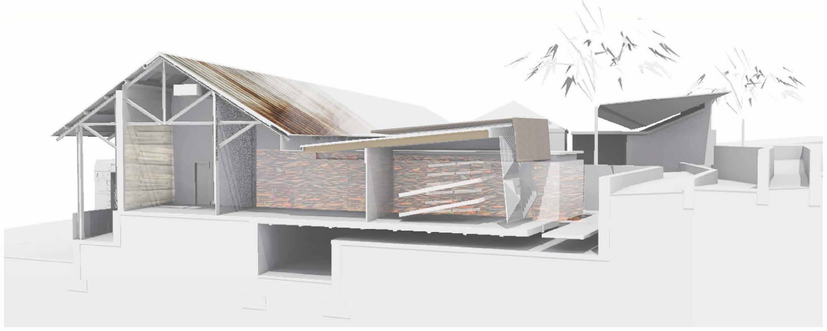
A large amount of the flexible spaces are housed under the existing shed structure, giving it a new ontology and meaning and the parts that protrude out of this cover are sheltered by corten roof plates that follow the plan shape of the respective spaces. The building then disappears into the landscape by way of copper coated steel hollow tubes that form a lattice above the product circulation route.

The choice of materials and their assembly are intended to allude to the concept of age and weathering. The building is intended to disappear into its origins – the membrane and timber can be recycled or even bio-degraded, leaving the stone walls, the new roofs and adjusted topography as markers of human activity on geography.

Materials



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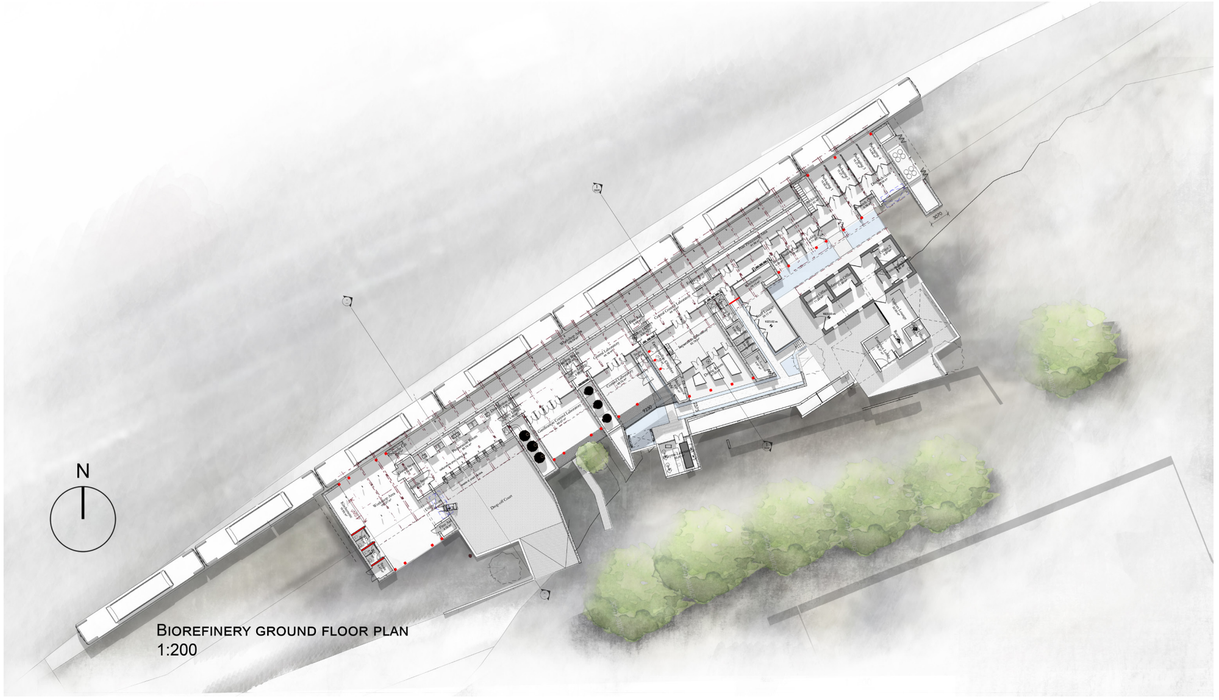

BIOREFINERY GROUND FLOOR PLAN
1:200

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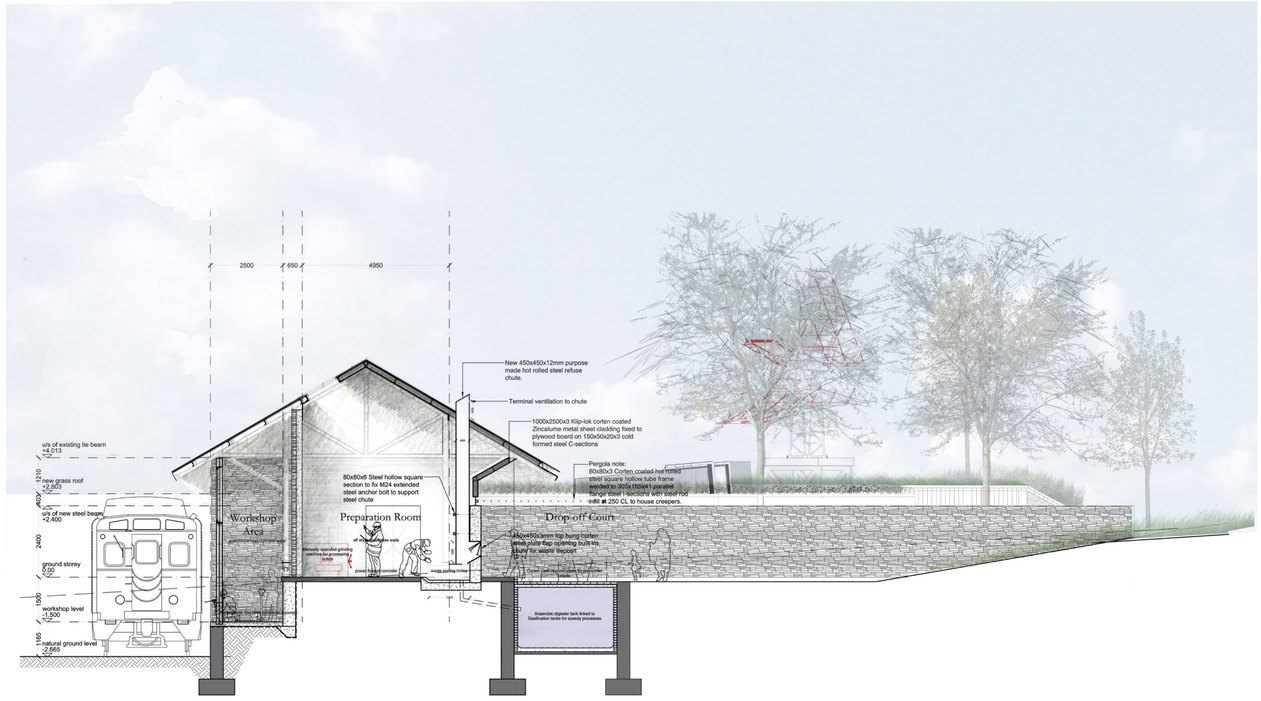

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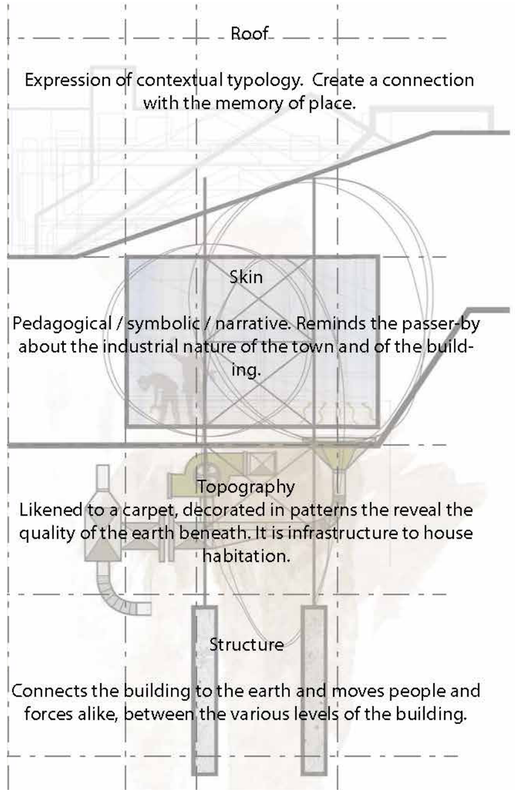
Chapter 9

Regenerative remodelling in detail

9.1 Theoretical Premise

Regenerative remodelling finds its best expression in the context of a thorough comprehension of place, which should, at all times be linked to its technology. This is the means to ascertain a narrative continuum of place. Moore's statement that we best understand technology through geography rather than history (Moore, 2007: 137) highlights the responsibility of a place-driven technology in assuring a continuum of story of place. Regenerative remodelling thus, in its technology too, has the responsibility to interpret human activity in space.

The theoretical premise for the technology of regenerative remodelling is situated within Stuart Brandts "shearing layers" of building which as discussed in chapter 8 places the act of remodelling in the spheres of the "fast changing layers" where addition is concerned, and the in the "slow changing" layers where sensitive interpretation occurs. The fast- and slow changing layers could be interpreted as the tectonic and stereotomic material procedures as defined by Gottfired Semper in Die vier Elemente van der Boukunst / the four elements of architecture. The shed building's construction will be elaborated upon as it exemplifies the technological strategy and intentions of all three buildings



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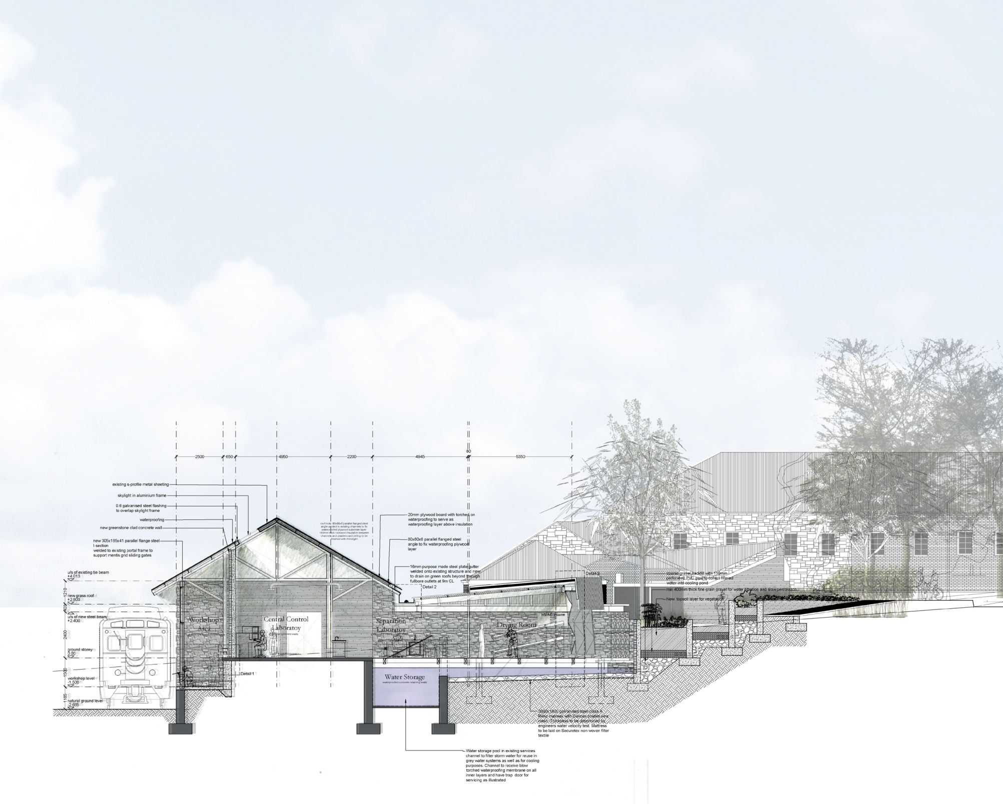
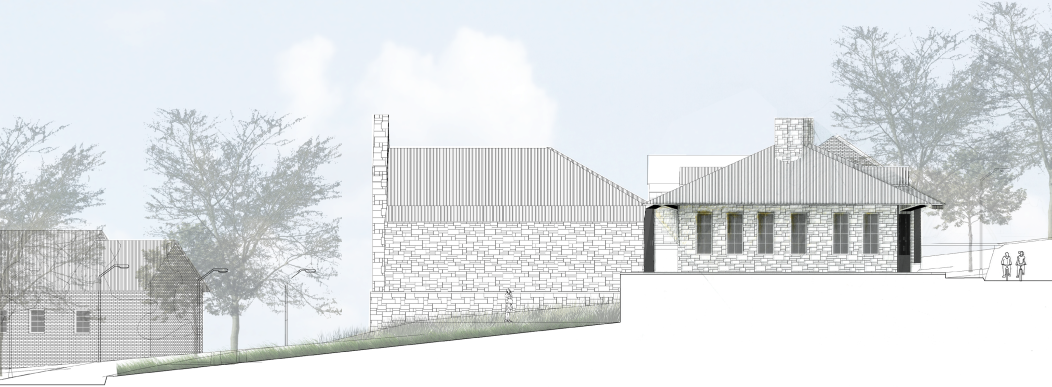

2500
650
4950
2200
4945
80
5350
existing s-profile metal sheeting
skylight in aluminium frame
0.6 galvanised steel flashing to overlap skylight frame
waterproofing
new greenstone clad concrete wall
new 305x165x41 parallel flange steel I-section welded to existing portal frame to support mentis grid sliding gates
u/s of existing tie beam +4.013
1210
new grass roof +2.803
403
u/s of new steel beam +2.400
2400
ground storey 0.00
1500
workshop level -1.500
1165
natural ground level -2.665
Workshop Area
Central Control Laboratoy
Separation Laboratoy
Drying Room
Detail 1
Detail 2
Detail 3
roof note: 80x80x6 parallel flanged steel angle welded to existing channels to fix waterproofed plywood substrate layer. 150mm thick rockwool insulation between channels and plasterboard ceiling to be finished with rhinolight
20mm plywood board with torched on waterproofing to serve as waterproofing layer above insulation
80x80x6 parallel flanged steel angle to fix waterproofing plywood layer
16mm purpose made steel plate gutter welded onto existing structure and new to drain on green roofs beyond through fullbore outlets at 9m CL
HVAC louvre
coarse gravel backfill with 110mm perforated PVC pipe to collect filtered water into cooling pond
min 400mm thick fine grain gravel for water filtration and slow percolation
New topsoil layer for vegetation
Water Storage
waterproofed concrete retaining walls
3600x1800 galvanised steel class A Reno matress with Galmac coated wire mesh. Thickness to be determined by engineers water velocity test. Mattress to be laid on Securetex non woven filter textile
Water storage pool in existing services channel to filter storm water for reuse in grey water systems as well as for cooling purposes. Channel to receive blow torched waterproofing membrane on all inner layers and have trap door for servicing as illustrated



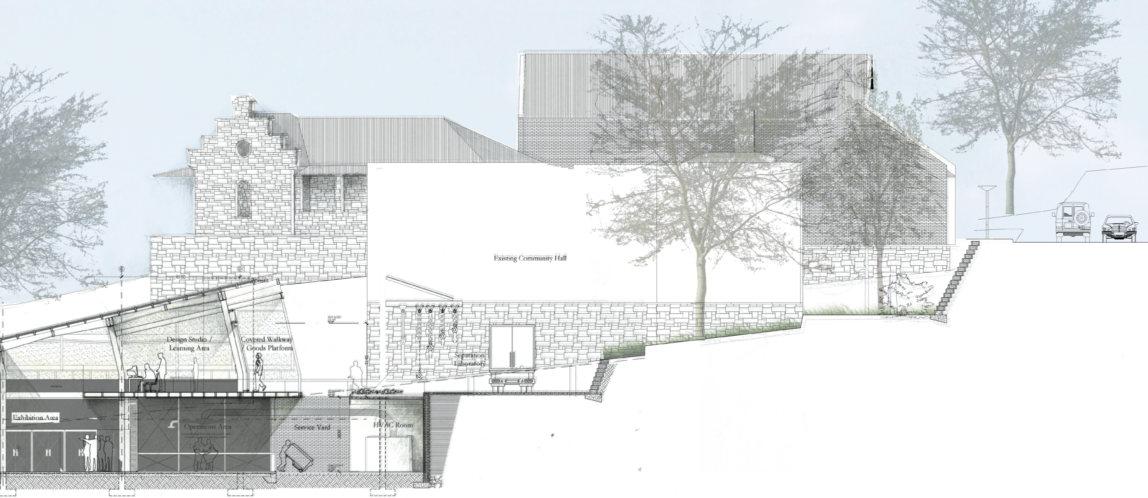
New Urban Foyer
Co-Creation Space
Cleaning / Drying Room
Large Scale Printing Area
Detail 4
4120
1720
3375

new brick terraces in new park to form narrative spaces around vertical objects like trees and canopies

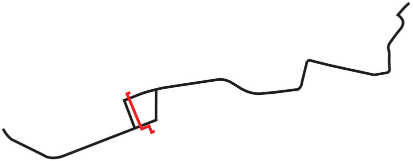
Roof note local shallow rooted grass species planted in 150mm of mineral planting medium on top of Elastomeric root resistant waterproofing membrane on 65mm ribbed concrete screed to fall into gravel filled gutter at 3 deg. Roof rests on 0.6mm galvanized metal roof deck fixed onto 305x165x41 parallel flanged hot-rolled steel I-sections.

metal framed inverted conical umbrella with extruded linseed oil membrane to collect water into concrete storage for product cleaning, showering and irrigation

600x600x35 Pentafloors® Anti static high pressure laminate access floor panels on a bolt and stringer understructure system to manufacturers specification. Access floor to function as services duct for drainage.


Existing Community Hall
C
D
6150
Detail 5
Design Studio / Learning Area
Covered Walkway / Goods Platform
clerestory
door height
3145
Separation Laboratory
Exhibition Area
Operations Area
Service Yard
3600
HVAC Room

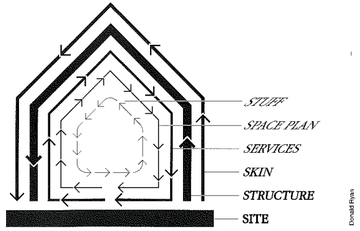
panel to
r heat pump
extractor fans
New 1200x2000 Matt mineral coated fibre glass tissue Lambdaboard® insulation to be fixed onto 75x50x2 cold formed angles which are bolted onto existing purlins
Discussion Room
existing sandstone walls
weathered oak hardwood floor
Co-Creation Space
Detail 6
Air inlet with operable cover and air filter at earth loop pipe entry
solar powered heat pump
Service Duct
Archeology and Narratives Research Area
offshutter concrete walls
Reading Lounge
Reference Collection
Multimedia Area
weathered oak hardwood floor
0.6 galvanised steel to cover cavity and allow ventilation to avoid moisture build up
220mm Rubber dumbbell waterstop
Metal sheet backing
light shaft +6.215
3180
u/s of existing wallplate 3.035
910
u/s of existing lintol +2.125
2125
existing ground floor +0.00
425
u/s of steel beam -0.425
1610
services level -2.035
1025
new ground storey -3.060
200mm dia. Polyethylene earth loop at min. 3deg fall to manhole
1200
Floor note: 85mm screed on 250μ polyethylene DPM laid on top of 500x500x125 precast concrete tiles which are laid on top of 255 R.C slab with a 1:150 fall to sump



9.2 Technical concept

“Buildings tell stories- if they’re allowed, if their past is flaunted rather than concealed” (Brand, 1994: 4)

The above quote from Brandt places emphasis on the participation of the tectonics of remodelling with place. The participation of an architectural language into the tectonics of place culturally, aesthetically and technologically cannot by satisfied by all elements of an architectural intervention. The tectonic concept groups Brandt’s shearing layers into roof, skin, topography and structure.



These four categories are intended to have a direct link with the processes housed in the building thereby making each of the elements part of the pedagogy of industry in the town. Conversely, the proposed fabric’s top mandate is to flaunt the stories of the existing buildings, landscape and the industry housed in them. The interventions become strategic because of this – they either conceal themselves into the topography and interact with the conditions of stone and soil (the shed), immerse and attach onto the existing in making new stories (the library) or create a condition of immersion, submersion and contrast to accentuate new urban conditions (printing facility).

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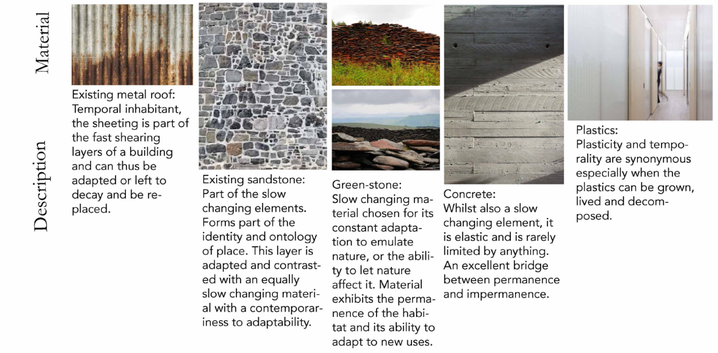
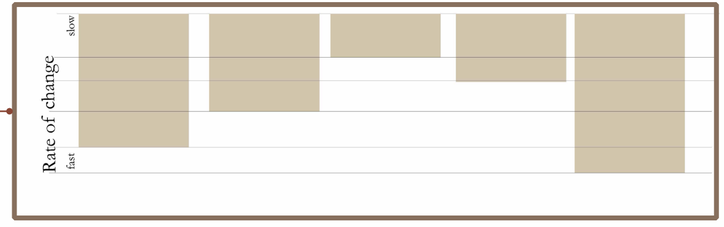
Materiality Logic





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9.1 Topography

The topography functions as the first threshold between old and new; visitors and employees served and service spaces. It is conceived as a resource for the functioning of the processes, human resource and place making. The planted landscape hides the large building from its fine grained context, as in the existing condition, and encourages visitors to enter into what is designed as an urban landscape where the visitor can participate with the processes by watching through portals designed to reveal the building and its internal processes at key moments.

The landscape consists of a semi succulent and dry shrub plating pallet as these are suitable for the shallow topsoil and can be exploited as a catchment of storm water from the landscape and town above.

The ramp and retaining walls of the new topography create subtle terraces that capture water and nutrients from the plants and drain it into the pools housed within the carved landscape allowing for nutrient rich water to percolate and provide the enzyme harvesting pond with mineral rich water for rapid enzymic production.Storm water is reticulated through subsurface 25mm diameter geopipes at 500 centre lines to the cooling pond. Inside the cooling pond are steel tubes that reticulate the high temperature fermented lactic acid into the synthesis and separation chamber where the polymerization occurs. The same water is then pumped into a retention pond for showering and cleansing purposes. The water then gets stored in the third pool where it awaits reuse for irrigation.

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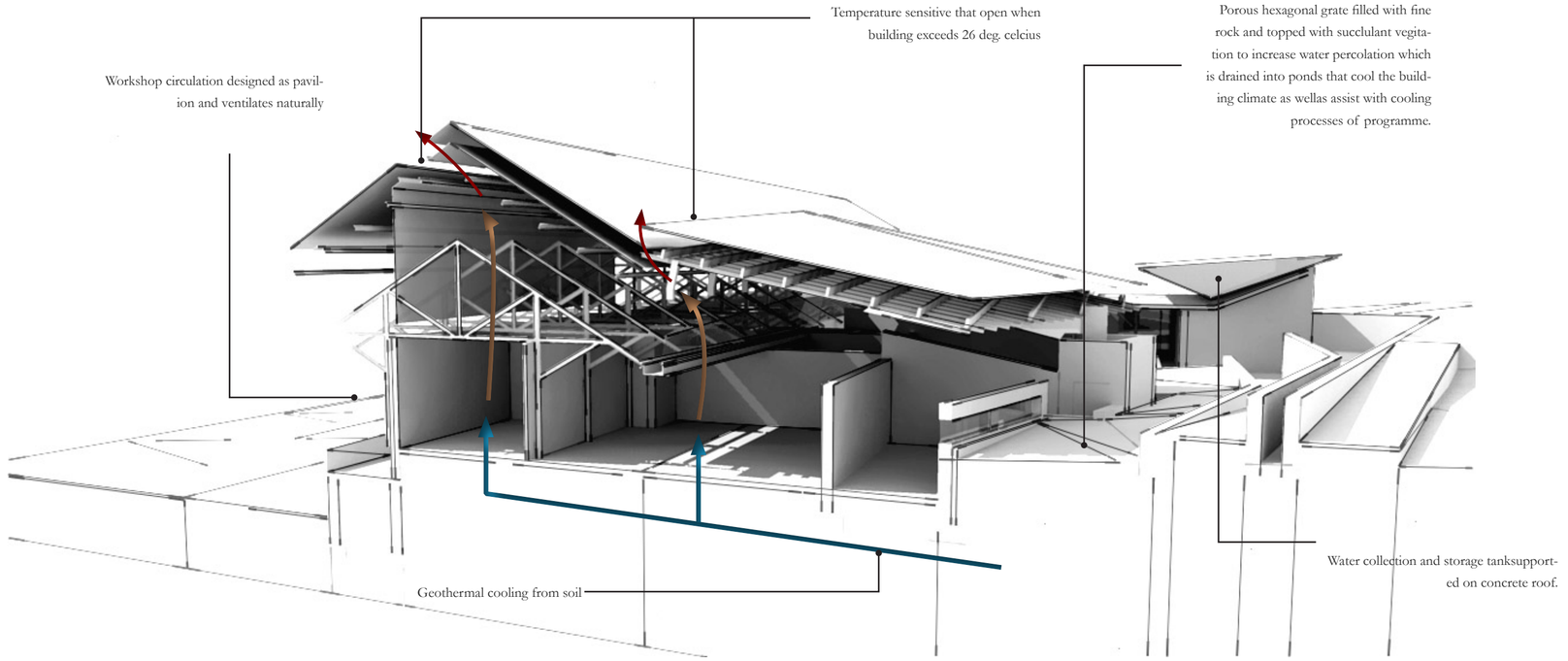

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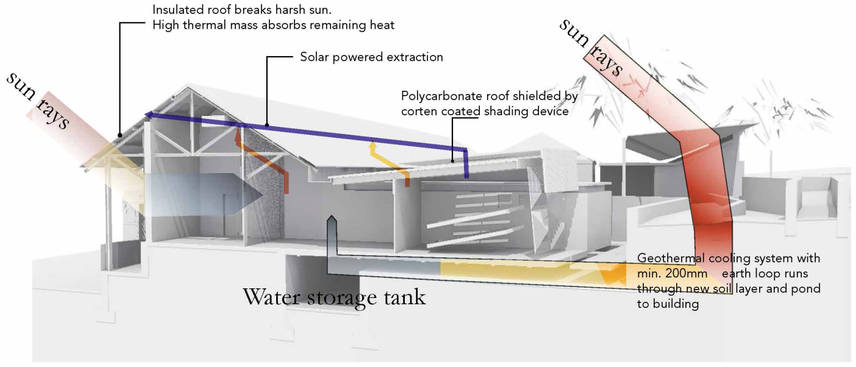
Energy /Comfort



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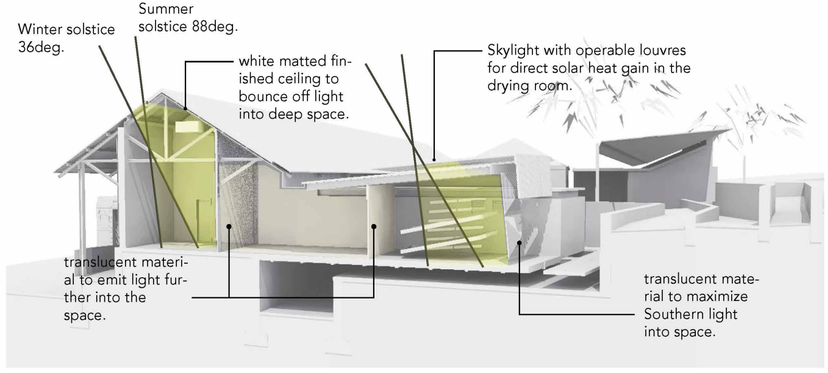
Natural Light



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9.2 Structure

As a mode of adaptation, the intervention relies on the tectonics of the existing shed in formulating a tectonic language for the additions. Though this may be the case, the proposed intervention introduces a new language that better connects the building to the earth physically as well as in a cradle to cradle fashion.

9.2.1 Existing tectonics:

The existing tectonics of the shed are comprised of a steel column and truss system where the columns are made from reused railway sleepers welded to a steel plate which is bolted (bolting method unknown) to the existing concrete platform. A steel Howe truss is welded onto the steel columns. The structural system is repeated at three meter centrelines across the 105 meter length of the shed. A series of reused s-profile metal sheets rest on hot rolled paralleled flanges which are welded to the truss.

9.2.2 Proposed Primary structure:

As with the services, the loads of the new roof are carried by the protruding stone walls. The walls are constructed in situ by stacking shards of locally sourced and cut greenstone into a temporary timber formwork. High density concrete is poured into the formwork on the non-face side of the stones. The aim of this method of construction is to achieve a "stone circle" aesthetic where water is allowed to weather the stone over time turning it first a red-brown colour and eventually black. The introduction of concrete is to better the structural performance of the walls but also to keep the internal spaces waterproof.

The walls are cast onto a 255mm thick composite concrete slab which rests on top of 219 x 6 hot rolled circular steel columns allowing the walls to hovers 200mm above the water of the pond beneath. The walls in turn support the floor slabs and roofs of the flexible spaces through 203x133x25 hot rolled steel I-beams onto which a composite slab rests.

9.2.3 Secondary structure

The building adopts timber as a material for the construction of the secondary structure for three reasons: 1) Is to create a distinct contrast between the old, semi-permanent steel framed shed and the new, semi temporal addition, 2) the availability of locally sourced timber (within a five kilometre radius of the town) made it an immediate material of choice, 3) there is also an availability of local labour expertise in timer construction.

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Intervention

Roof 4:

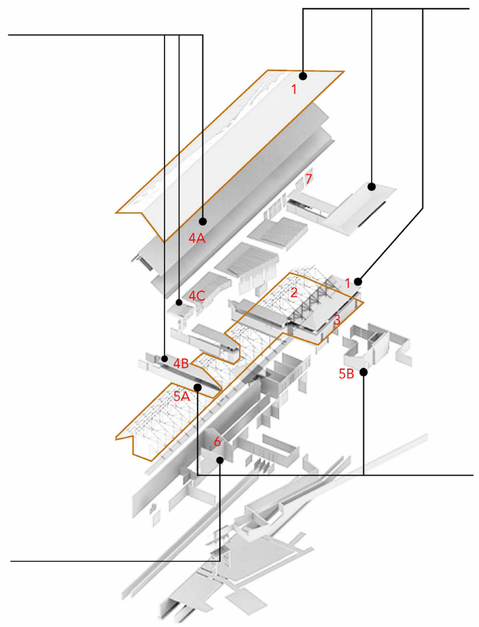
A. Climatic adaptation of building ontology - 1200x2000x100 Insulation board.

B. Planted concrete roof

C. Klip-Lok Zinkalume steel roof sheeting, poly carbonate roof sheets screened by corten coated hollow steel tubes

6. Secondary structure Denpal polycarbonate internal partitioning walls

7. Tertiary structure Extruded linseed membrane to detail.



Heritage sensitive layers.

Roof:

1. Corrugated S-profile metal roof sheeting.

Primary structure

2. Re-used railway tracks
3. 400 wide Sandstone walls

5. Primary structure:
   A. Green-stone clad cast in situ walls on steel supports
   B. Cast in situ off shutter concrete walls

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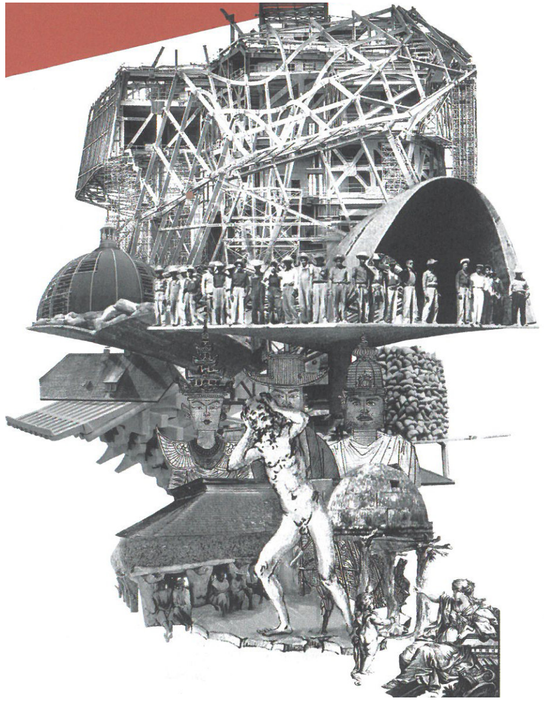
9.3 Roof

In a book series on the elements of architecture, Irma Boom (Feng, et al., 2014: 403) identifies the roof as the element of architecture that carries the image of local. The roof, according to Boom, has always been a medium to express social status and political stability whilst remaining flexible enough to accommodate changes in regime (Feng, et al., 2014), an element of continuity for the architectural language, tradition and identity. The roof thus becomes an expression of the contextual typologies.

In the shed, the new roofs are treated as subtle additions to the existing so as to not compete. The roof is an assembly of 0.6mm galvanised craft-lock roof sheets at 3deg. fixed onto a 2500x1200x12 continuous plywood subsurface for application of waterproofing, fire proofing and roof material.

The plywood is fixed onto 50x114 timber purlins supported by glulam beams. 1200x600x12 Nutec fibre cement ceiling board to be finished with Rhinolight for ambient daylight into the deep space.



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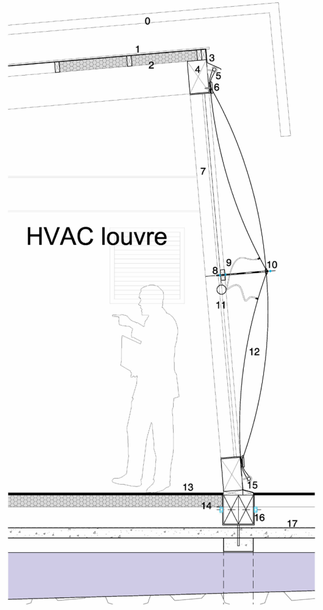
9.4 Skin

The walls of the semi-temporal, are non-loadbearing and can therefore be expressed in linseed oil bio-plastic membrane panels which are fixed to timber framework with aluminium fixers as illustrated in fig.x



1. 1000x2500x3 Klip-lok Zincalume steel roof sheeting to be fixed on 70x50 timber purlins @1200 CL to fall 5deg. to steel gutter.
2. 1200x2000x100 Matt mineral coated fibre glass tissue Lambdaboard insulation fixed on 70x50x2 cold formed angles.
3. 2mm preformed anodised charcoal painted coping screwed between timber purlins and roof sheeting.
4. 165x279 Continuous laminated glulam beam to be supported on glulam timber studs at 3000 CL.
5. M16 Steel rod supported on steel screw hooks to support fibre reinforcement for linseed oil membrane.
6. Aluminium membrane clamp.
7. 165x279 laminated composite timber stud at 3000CL.
8. M16 Steel rod bolted to 70x50 Grade 7 SA Pine joist to create node joint and support for air pipe.
9. 12mm dia. uPVC air supply pipes to PVC valve on membrane
10. EMPA clamp node fixing to be bolted with Allen key nut for security.
11. 50mm dia. Charcoal painted PVC air supply pipe to be supported by 2mm anodised aluminium strap screwed onto timber frame.
12. Extruded linseed oil membrane to receive clear spray on fire proofing or fireproof chemical to form part of extrusion process.
13. Reclaimed weathered timber floor tiles
14. 1200x2000x100 unfinished Lambdaboard insulation boards on 70x50 cold formed angles.
15. 2mm Preformed continuous charcoal weather bar to be screwed onto timber as indicated.
16. 279x144 glulam joists in 6mm continuous steel casing chemically bolted to concrete slab.
17. 85mm Cast-in-situ concrete slab with blow torched bitumen waterproofing on precast reinforced concrete ground beams.

Detail 3_Linseed Oil cladding

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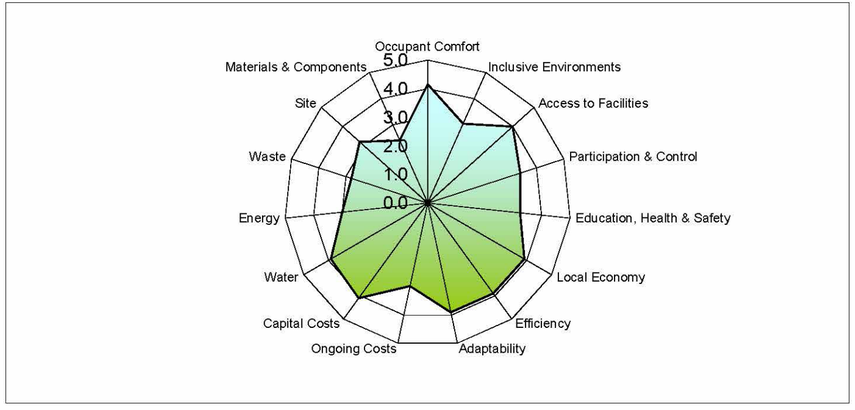
SUSTAINABLE BUILDING ASSESSMENT TOOL (SBAT- P) V1

PROJECT		ASSESSMENT	
Project title:	Additive manufacturing & ancillery	Date:	23-Oct-18
Location:	Waterval Boven	Undertaken by:	Siphiwe Semelane
Building type (specify):	Community/Industry	Company / organisation:	
Internal area (m2):	2012	Telephone:	Fax:
Number of users:	471	Email:	
Building life cycle stage (specify):	Design		



Social	3.6	Economic	3.8	Environmental	3.1

Overall	3.5

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Chapter 10
Conclusion

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