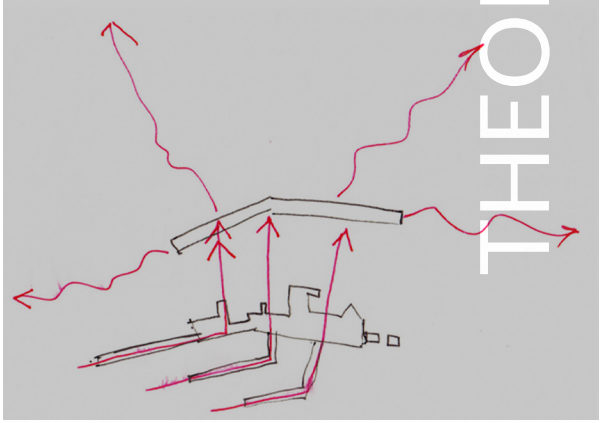
Chapter 4:
Regenerative theory

THEORY



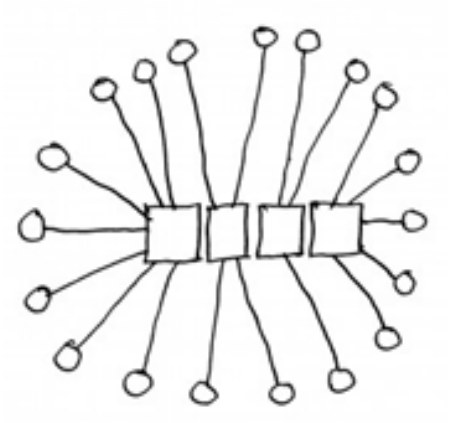
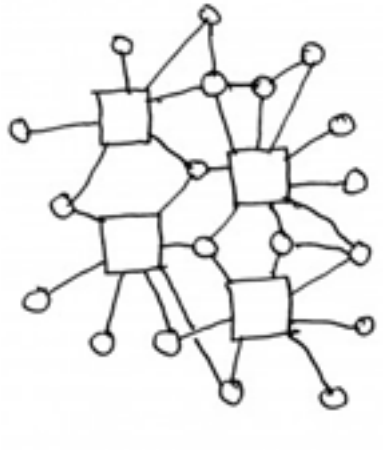


Fig 4.1 Resilient diagram (Metropolismag, 2016).



"It is an architecture that embraces the environment and uses the millions of years of engineering and evolution as the foundation for a regenerative structure" (Littman, 2009: 1).

4.1 Sustainable design limitations

Le Corbusier stated during the Modern Movement that the household is a machine for living. This negated the outside world and everything beyond the walls of the dwelling space. Sustainable design started to look at the earths "household" and how we live in the greater context. How the culture of this time had adopted a design strategy that essentially says if something is not working, you are not using enough energy (Nesbitt, 1996: 401-402).

Sustainable design was based on the respect for human life, the natural world, and its complex processes. It critiques the past movement of modern architecture and the condition of modernity. McDonough, who became the spokesperson for sustainable design, created eight ecological points. These ecological points required society to look at long-term environmental implications of their actions which then started ideas of sustainability (Nesbitt, 1996: 401-402). There was an increase in awareness that buildings had to take the environmental impact into consideration. But yet a sustainable building can be defined in the broader context as one that has a minimum impact on the natural. The building itself has a minimum impact on the immediate surroundings in either negative or positive manners. The building did not contribute anything to the site, it simply sat upon it (John, at al, 2004: 320).

As much as sustainability was an improvement on the past movements, it had its limitations. Sustainability looked at how the building could have a net zero impact on the site. Creating energy on site for the needs of the building and satisfying all the needs of the user and the building. It did not look at the needs of the site and the larger context that it is situated on. This brought about the architectural language of "green paint", covering the building in solar panels and incorporating solar stacks. It created a movement of making buildings "less bad" but not making them better for the environment.

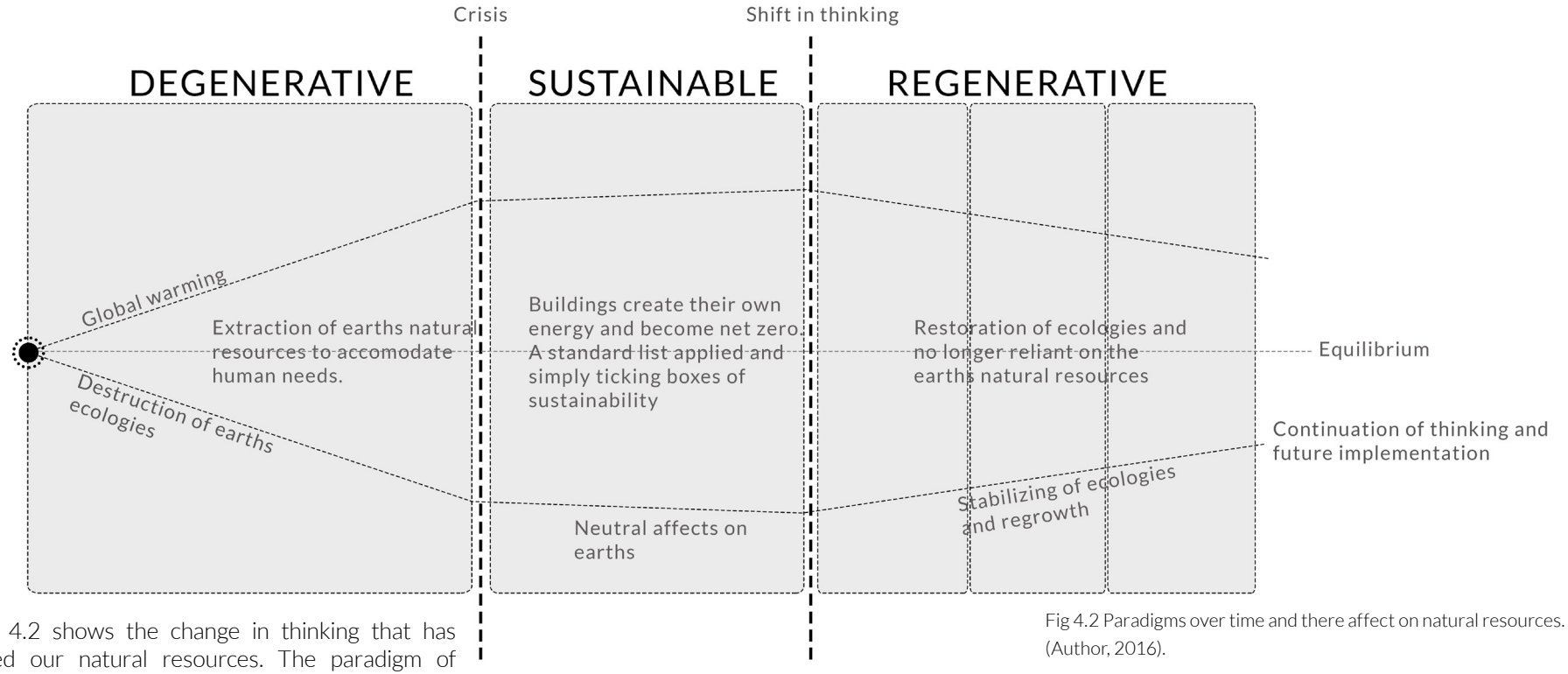


Fig 4.2 Paradigms over time and there affect on natural resources. (Author, 2016).

Figure 4.2 shows the change in thinking that has affected our natural resources. The paradigm of degeneration during the industrial era led to mankind taking advantage of natural resources. These have became depleted and have damaged our natural ecologies through global warming and extraction of natural resources. The realisation of global warming created a crisis this led to approaches like sustainability. During this time buildings were designed to achieve nett zero energy usage and the negative effect on natural resources and ecology is slowed. But these approaches did not replenish or regrow resources or deliver energy. This led to a new way of thinking which encouraged the restoration of ecology. This will hopefully will lead to the reverse of global warming and improve the future.

4.2 Regenerative theories

The Green Building Association developed four practical points that could be applied in order to overcome the previous mind-set of sustainability (Cole, 2012: 5). This led to the LEED and BREEAM rating system (DU Plessis, 2005: 3). The 4 main points are;

- The return to the use of natural building materials and the effective use of resources, like recycling.
- Buildings should aim to be self-sufficient, for example, by gathering solar energy, collecting filtered water, waste management; all to be achieved with appropriate technologies.
- The integration of the building with the site condition.
- An ultimate improvement in the air quality of a building.

This need for a greater environmental understanding brought about regenerative theories. It is distinctly different from sustainability in the way that it looks at integrating and connecting natural systems and the site to the architecture. It still focuses on conservation and performance by reducing the environmental impact of the building but it takes it one step further and views the site as an equal stakeholder in the architecture. "A full understanding of natural and living systems in the design of a structure" is utilized in regenerative design (Littman, 2009: 1).

The theories of Regenerative Architecture do not mean that the building is 'regenerated', in the way of self-healing, like a living system. Rather it means that a regenerative building is a catalyst for positive change within a unique place in which it is situated. This looks at a specific situation or site that has declined to a point where it is right for renewal (Cole, 2012: 54).

Using regenerative architecture to explore how ecosystem services available in Hartbeespoort dam could be utilized to create exchanges through a public interface to the existing dam wall (Cole, 2012:54).

Applying regenerative theories to a project means that you need to look at the engines of positive or evolutionary changes for the systems into which the building can be built. This means that you need to look at the specific site and its characteristics, you cannot simply apply a list and tick boxes which occurred with sustainable thinking(Haggard, n.d;1).

An understanding of the site and its inherent characteristics are crucial to regenerative thinking. Looking at the Hartbeespoort Dam and viewing the water as a broken system that needs to be regenerated can only happen with a full understanding.

We have to see ourselves as being part of nature, part of a life system, that occurs on this earth in order for it to function. Life is made up of many reciprocal relationships, meaning there exists continuous exchanges between two or more living organisms which are beneficial to both parties involved (Mang, et al, 2012: 9).

As already stated the site has been majorly affected by humans, this is due to our previous paradigm of degeneration. Moving to think of sustainability will not help the Hartbeespoort dam as it has become so unbalanced that it will not be able to restore itself. Regenerative theories need to be applied in order to rehabilitate the site.

Life is constantly evolving, changing and is never in a static state. Reed (2007: 2)defines restoration as a system that can progressively self-organise and evolve. In a similar way we need to change the past paradigm of infrastructure, as not just fulfilling a single function, but a regenerative infrastructure that fills many different functions and shifts and changes over time according to different needs.

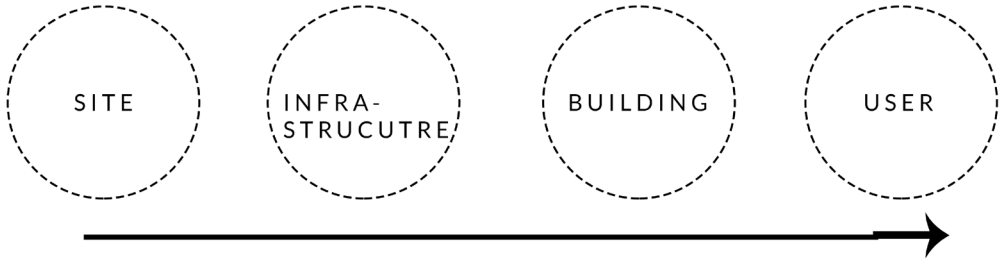


Fig 4.3 Linear diagram (Author, 2016).

This diagram shows a linear flow of materials from site to user. This is often the case for the built environment and destroys the landscape on which is depends. This diagram was called a 'one-way-linear-flow' by Lyle which he highlights as a degenerative system. This depletion of resources due to one way flow of energy will lead to the system eventually collapsing as nothing is replacing materials and energy (Mang, et al, 2012: 7).

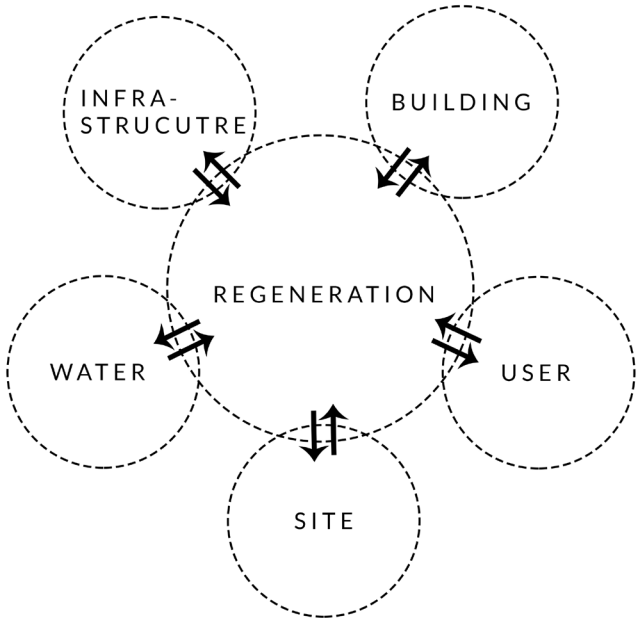


Fig 4.4 regenerative diagram (Author, 2016).

This shows the restructuring of material flows in a regenerative design. This regenerates the site and surrounding areas and adds resilience to the buildings ability to function (Mang, et al, 2012: 7).

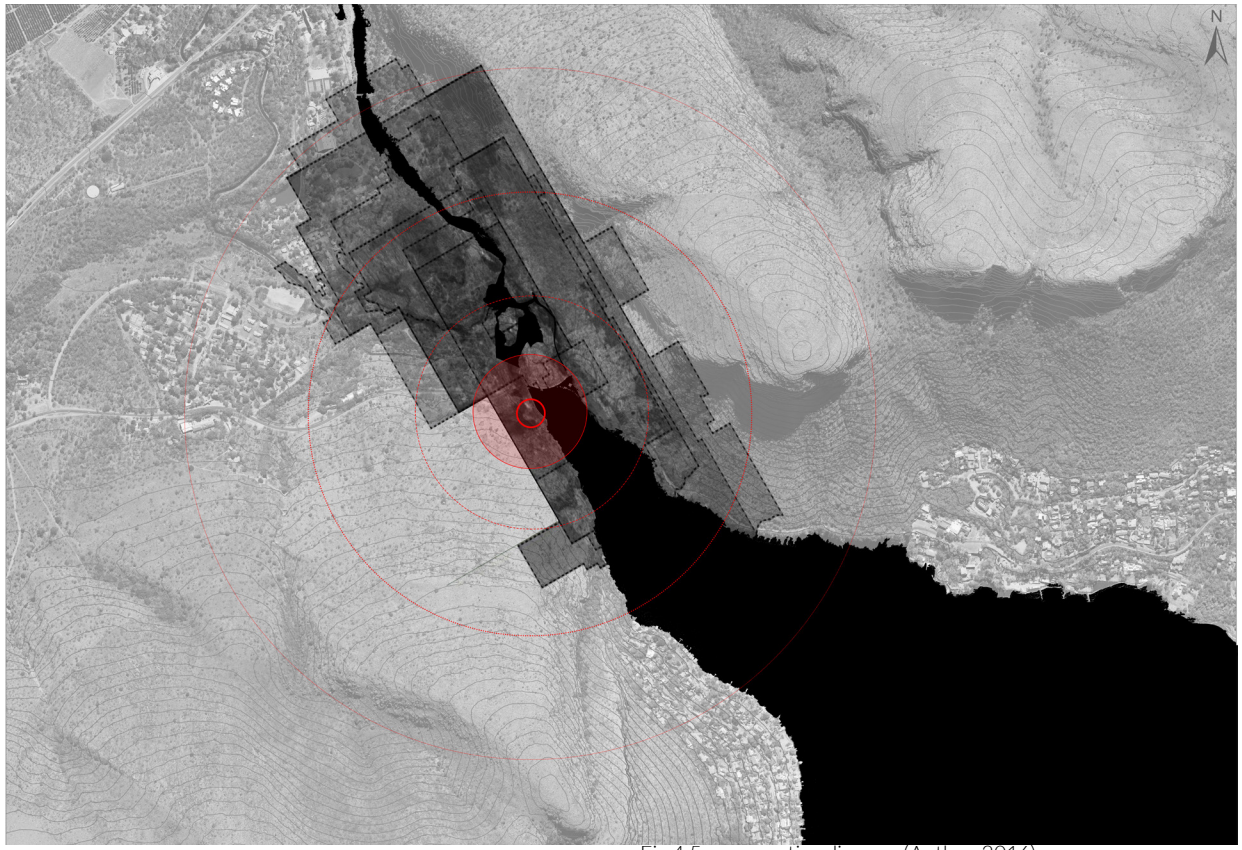


Fig 4.5 regenerative diagram (Author, 2016).

This diagram shows the positive effect on the scarred landscape that this new infrastructure can create. Over time it could regenerate more and more of the site as the system comes more effective. Changing people's perceptions, which is the intent of this building, will reach a much larger area and be able regenerate other sites.

Fig 4.6 regenerative diagram (Author, 2016).

By changing the state of the water back to a balanced system and the shorelines as well as the agricultural land that the water irrigates, will also be regenerated.

This makes it a prime location to intervene as it will create the most effect possible. The public remediation program at this point will hopefully lead to many of the other solutions, that have been set up by the Department of Water Affairs, to become more public oriented. Many people are unaware of the problems that present at Hartbeespoort Dam and are therefore ignorant to the change that needs to take place.

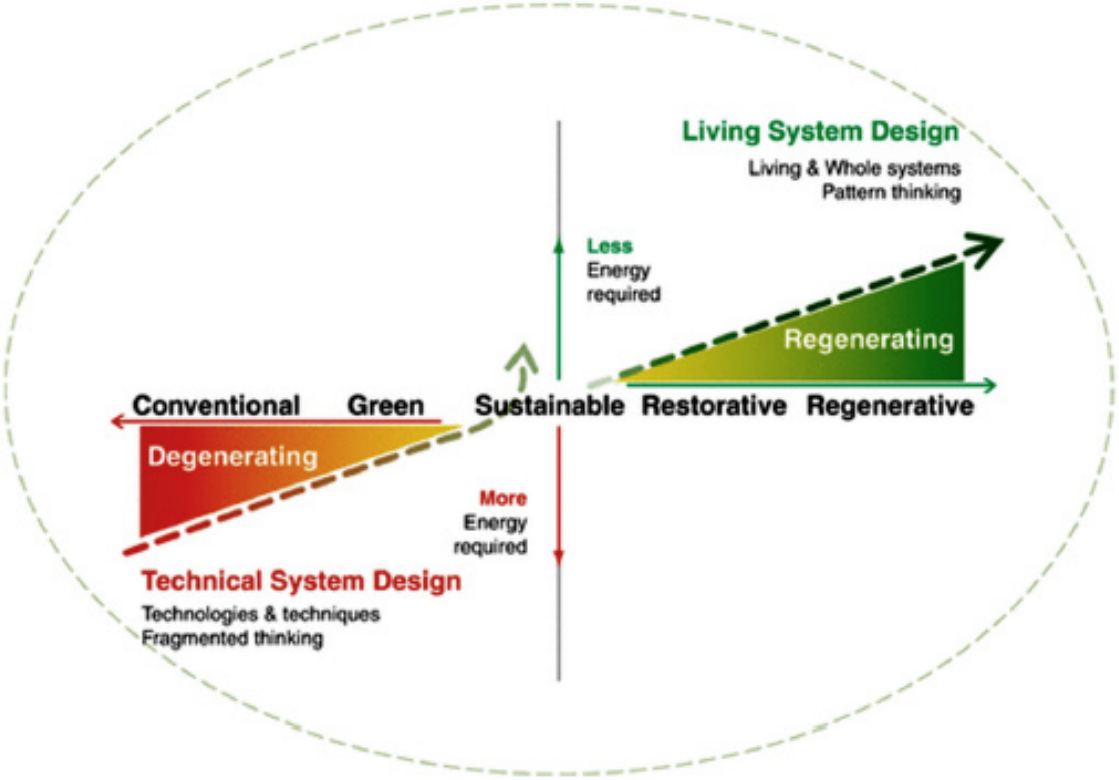


Figure 4.7 the shows the rehabilitation that a site can undergo through moving from anthropogenic idea of degeneration to biocentric thinking of regenerative theories. Framework for sustainability, contrast of technical system design and living system design (Mang et al, 2012: 10)

4.3 Design applications

This dissertation uses regenerative theories as a departure point for the design. The architectural intervention will be tested against Steven Moore's eight points for regenerative regionalism. He contextualises these eight points in a non-modern regionalism refuting modernity and post-modernity. The eight points have been ordered in importance (Canizaro, 2007:433-442).

- Rather than constructing objects, the architect must construct integrated cultural and ecological processes to create social activity (Canizaro, 2007:433-442).
- A regenerative architect must concern one's self with the production of a mutual agreement that ties humans to the ecological condition of the place (Canizaro, 2007:433-442).
- The reproduction of life-enhancing practices is preferable over aesthetic (Canizaro, 2007:433-442).
- Regenerative architects must create regenerative technology that must look at engaging humans and objects that inhabit space (Canizaro, 2007:433-442).
- A critical place can become regenerative only through the production and reproduction of democratic, life-enhancing practices (Canizaro, 2007:433-442).
- The architecture must be understood and appreciated by the local community and secondly the building must be relevant to everyday life of this community (Canizaro, 2007:433-442).
- Regenerative architects should resist following optimisation of building comfort and rather look to go beyond this. Secondly architects should use technology that reveals itself to local labour to increase knowledge (Canizaro, 2007:433-442).
- A regenerative architect will enable citizens in the decision-making about the technology that enables everyday life (Canizaro, 2007:433-442)

These points gave clues to program as well as design intentions. Specifically looking at how to integrate ecological processes into social activities, a good example being the vermiculture activity on site and how to integrate the user.

This would then tie humans to the ecological conditions of place. The program tries to do this by creating direct relationships between the systems and the typical spaces used by the visitor, such as the restaurant where visible processes will produce a direct appreciation of the "food chain". If it is functioning correctly the restaurant will have tastier and healthier food.

So rather than creating a beautiful object in the landscape it is more important to construct systems that have a direct influence on the user of the space.

These points also bring up the fact that the architecture and technology used in this building must be legible and understood by the local community. Representing these exchanges between the site, user and the infrastructure are crucial in order to do this.

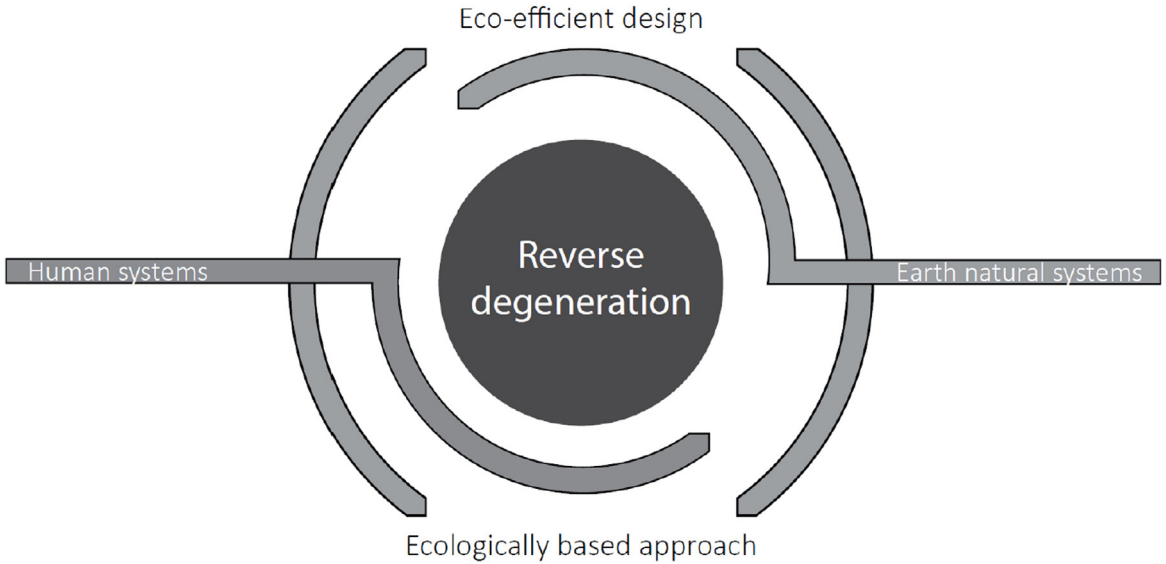


Fig 4.8 framework for reverse degeneration (Boonzaaier, 2015: 48)

4.4 Learning from nature

There are three main categories that we can learn from nature and which can be utilised in regenerative architecture.

Everything we need to design with has already been designed by nature through evolution. All materials have already been created that we can simply employ. Natural materials have no life span as they can constantly be recycled and recreated, contradictory to our belief of waste. This is especially important in the built environment; looking at how our materials can be re-utilised or purposefully decay to become food for another system. (Nesbitt, 1996: 401-402).

Secondly nature is the constant flow of energy from one system to the next. This energy is never destroyed or recreated; it simply moves from one form to the next. Nature is an extraordinary complex and effective system for creating and cycling of nutrients. The important thing is to see how we as humans fit into this flow of energy; if we are disrupting it or allowing it to continue. (Nesbitt, 1996: 401-402).

Lastly and most importantly is biodiversity. This allows living systems to continue rather than spiral out of balance. The extremely intricate and symbiotic relations between millions of organisms, no two of which are alike, allow this to happen. (Nesbitt, 1996: 401-402).

Through the design investigation these three points need to be taken into consideration as informants. From the building, to details, to the system that it contains, all need to employ the concept of waste equals food, energy flow, and protection of biodiversity in the design (Nesbitt, 1996: 401-402).

The systems that are implemented on site need to increase biodiversity and create complex and interwoven systems that become resilient over time in a similar way that nature does. Materials proposed on site need to be sourced from site and thought of what they can be used for afterwards.

4.5 Waste to energy

Regenerative theories remove the idea of waste; waste becomes a product for a second system, the input to gain another output. This gives value to waste products.

These products can be broken down into three main categories:

Firstly consumable products, this includes food, paper, tin and plastic etc. These are all materials that can be broken down and reused relatively easily, either on-site or at a recycling plant.

The second kind is service products; these are items such as cars and televisions, tables and chairs. This kind of product should be sold with a license. This license and the product could be sold on to a second user. The implication is that the end user has to return the product with a license to the manufacturer. This allows proper disposal of products and cradle to cradle systems.

The last kind of product is called an unmarketable. These are products that cannot be recycled such as nuclear waste, dioxins, paint and batteries. These are products that have to be kept until we have figured out a way to dispose of them. These products should be kept to an absolute minimum where possible (Nesbitt, 1996: 403-404).

Looking through the lens of regenerative theories architecture does not consist of a building placed upon a site but rather architecture as site, systems, energy, flora and fauna etc.

The systems that are implemented into the site by learning through nature need to focus on being consumable waste. This means that the outputs of one system need to be the input to another and therefore linking them and integrating them into the site.

4.6 Heritage memory

According to the Burra Charter (1999: 1), "places of cultural significance enrich people's lives, often providing a deep and inspirational sense of connection to community and land-scape, to the past and to lived experiences." These places become "historical records" that act as tangible expressions of identity and experience. They tell us about who we are, and how our past informed us and the landscape we inhabit. The dam wall and the Arch built to celebrate it forms an integral part of the history of Infrastructure in South Africa , and the infrastructural methods at the Hartbeespoort Dam that existed informed not only the construction of the dam wall and its heritage, but also the processes that exist today, as well as the new ones of the future. Our infrastructural heritage is therefore a part of our cultural identity, and the places where infrastructure was built give us tangible experience of that identity. The term "cultural landscape" was coined by cultural geographer Carl O. Sauer in the 1920s (Foster, 1999; 5-10). The site at Hartbeespoort Dam can be viewed as a "cultural landscape": The construction of the dam wall and the Arch that commemorated it formed and altered what had been before, and the landscape in its current form depicts that phenomenon.

Article 5.1 (Burra Charter, 1999:4) indicates that the "conservation of a place should identify and take into account all aspects of cultural and natural significance without unwarranted emphasis on any one value at the expense of others." The site has cultural value, but it carries great natural value as well, bearing in mind the valuable water source and the existing natural systems which feed off from the water.

In the conservation of The Arch, two relevant methods have been identified. Firstly, preservation, "where the existing fabric or its condition constitutes evidence of cultural significance" (Burra Charter, Article 17, 1999:7). Secondly, new work, where "new functions will be brought to the site, with the assurance that it does not distort or obscure the cultural significance of the place, or detract from its interpretation and appreciation" (Burn Charter, Article 22.1, 1999:7). The Burra Charter highlight the issue that any new additions such be identifiable as such and read differently to the existing condition (Burra Charter, Article 22.2, 1999:7). Another tool that the Charter grants in the approach to intervention is that of interpretation (Burra. Charter, Article 25, 1999:8), as the cultural significance of the Arch is not readily apparent, and should therefore be explained by interpretation. This needs to "enhance understanding and enjoyment, and be culturally appropriate."

Fig 4.9.1 Victory Arch (Author, 2016).

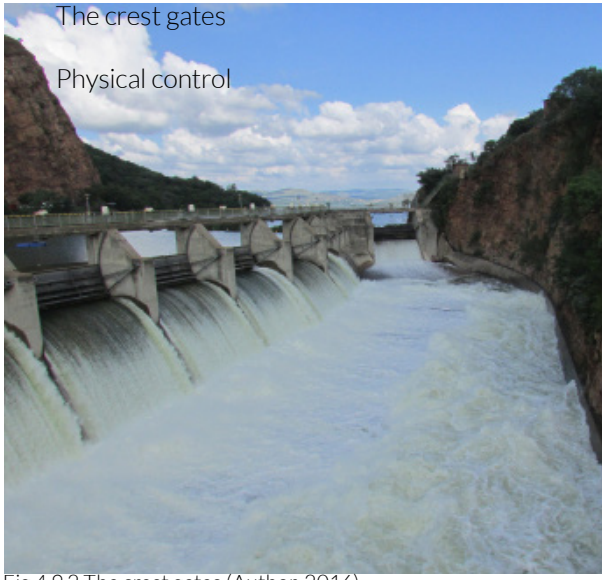


Fig 4.9.2 The crest gates (Author, 2016).

4.7 The New Celebration

Rather than removing the Arch and losing the memory of the past it will be retained as it datum point for the new monument. This will allow the user to gain an understanding of where we come from and where we need to go.

The arch also stood as a monument against white poverty. This is no longer the case as the water is now ineffective to use on agriculture. By creating a new monument the water quality would improve and this monument could stand once more against all poverty in a new South Africa. It is also a monument to those who fought in the war and this needs to be retained on site.

The arches form stood as a gateway to many cities. This feature of the form can still be utilized as it is creating a new gateway to this regenerative infrastructure which will become the new monument.

The form of the new monument could create a journey leading towards the arch in order for it to be seen in a new light. This means the new monument should not over power the Arch but rather emphasis it. The size of the building needs to be kept within the scale of the arch. There is the possibility of using its classical ordering form in the new celebration of water, in this way relating the new form to its historical context.

There is a need for a new celebration of water heritage, where man is seen as part of nature and is reliant on water. This new celebration must change the meaning of the arch and show that a paradigm shift has occurred. A palimpsest of monuments showing the changing way we view our natural resource, water.

The crest gates speak of an industrial heritage as they were designed with only one intention: to increase the dam's volume. They are a purely infrastructural element on site. This project aims to challenge the idea of industrial heritage and it's singular function by creating more roles that it can play in this new celebration of water. The building will attach itself to the infrastructure in a parasitic approach in order to regenerate the surrounding site.

The intervention will also celebrate the centenary of the heritage by overlaying a new layer depicting that new paradigm over the old, with the new layer still enabling celebration of the heritage. The idea is to celebrate the heritage by overlaying the paradigm shift and create dialogue between old and new through exchanges.

Fig 4.10 the Arch at Hartbeespoort dam with new ideas of celebration of water (Author, May 2016).

4.8 Regenerative Precedent

Project title: Borderline mediated landscape

Designer: OTH Architecten

Location: Amsterdam, The Netherlands

Year: 2007

This building sits on top of the former concrete crane-way of a ship yard, a forgotten relic of Amsterdam's shipping industry that was built in 1952. The new office block regenerates the site by adding offices to the structure that sits over the previous infrastructure (archdaily, 2008).

This lightweight steel structure supports three levels of offices and then is clad with a light glazing panel. The stereotomic concrete structure that existed as the shipyard is used as a sub structure to the building and anchors itself in the site, yet the new structure floats above it separating itself from it. Thus emphasising its historical value and making a clear distinction between new and old (archdaily, 2008).

The new building makes use of the existing structure for additional storage space and fire escapes. The existing stair way has now become the new entrance into the building with an additional lift.

The facade is made up of lightweight glazing panels with transparent double skinned glass. This allows natural light into the building but there is solar control of this by adaptive motorised louvres that shield the building in summer. In between the cavity of the glass passive ventilation is allowed and also acts as a buffer between the cold in winter and the heat in summer (archdaily, 2008).

This project is a good example of regenerative thinking as it successfully preserves an industrial heritage artefact and adds significant value by creating a new sustainable office block. The building is also a good example of a heritage response and can be utilised as a precedent for this dissertation. There are many similarities between this project and the intents of this dissertation, specifically looking at the relationship between the infrastructural historical bases and placing a new regenerative lighter structure that floats upon it.

This project also highlights the new intervention compared to the existing infrastructure extremely well. It does this through material choice as well as detailing. Figure 4.15 shows how a walkway is set slightly off the infrastructure ,the floor material is metal grating which is transparent and lets you see down to the water below. Doors are set back into the infrastructure showing their secondary nature. These are all techniques that could be used in this dissertation. The material pallet would also be appropriate in certain spaces.

Fig 4.11 Finished Kraanspoor building (Archdaily, 2008).

Fig 4.12 Historical Kraanspoor infrastructure (Archdaily, 2008).

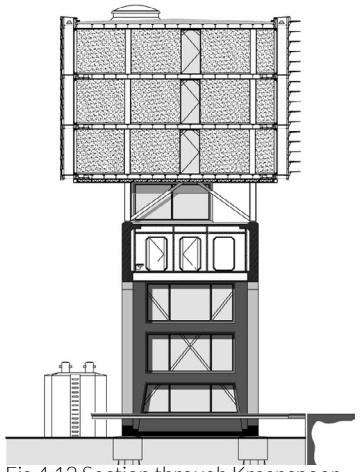


Fig 4.13 Section through Kraanspoor building (Archdaily, 2008). 2008.

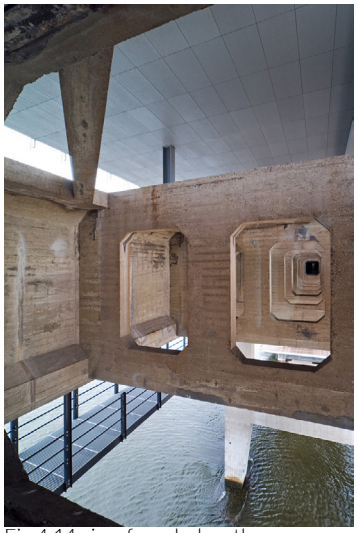


Fig 4.14 view from below the Kraanspoor building (Archdaily, 2008).

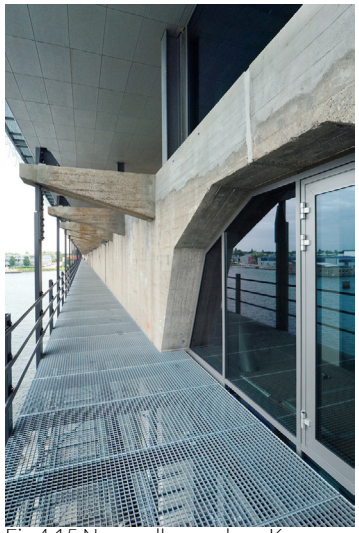


Fig 4.15 New walk way along Kraanspoor building (Archdaily, 2008).

Fig 4.16 New stairway up Kraanspoor building (Archdaily, 2008).

Fig 4.17 Double glazing panels with louvres of Kraanspoor building (Archdaily, 2008).

Fig 4.18 View from water of Kraanspoor building sitting lightly above existing historical structure. archdaily. 2008.