

CHAPTER 3: THEORY

INTRODUCTION

Further development of the theoretical approach to the river system as a whole was necessary in order to determine the site specific approach for the intervention.

The intention behind the choice of intervention is placed on the idea of connectivity at various levels, depths and manifestations of connection will have an impact on the type of relationships developed by it.

When dealing with urban river front design, there are a number of aspects which need to be considered in order to be able to respond to the context in which it is placed, namely ecological, economic and social.

The promotion of human access to riverfronts and their effective restoration is an intervention which requires complex integration between the urban and natural environments.

This complex relationship is the reason that the idea of connectivity may have conflicting connotations depending on the nature and focus of the approach to the intervention - city development versus ecological preservation.

The success of the intervention will be determined through the capability of the design to find common ground between environments by minimizing the destruction of ecological systems while still maintaining the educational and aesthetic experience of the urban dweller.

The main issue is the accessibility of the river to people, linking the river

conceptually, visually and physically to the surrounding environment, creating public space through the incorporation of social attractions.

It is important to investigate the various approaches to connectivity for the understanding of the role that the intervention will play in terms of meeting ecological and social requirements.



Figure 2.3.1: Intended connection between separated communities (Author, 2015)

ECOLOGICAL CONNECTION

The rehabilitation of the natural environment and processes surrounding the urban river system is the main consideration of the intervention, through the purification and rehabilitation of the resource, it enables the connection to both social and economic possibilities resulting in the connection of the urban and natural environments.

The idealistic approach to urban river systems is their complete restoration, however due to the connection of the river systems to human processes, they differ fundamentally from rivers in their natural state.

It is important to take into consideration that the urban river will never be able to be restored back to its natural state due to the high level of influence and impact the urban environment will have on the river system. Godfried explained this relationship by saying “most human activity connects to the river not through the riverfront vistas but through the exposed fabric of nature that is all around us, roof tops, gutters, roads, factories, swimming pools and waste water treatment plants are all necessary parts of the urban water cycle.

The first step towards healthy urban rivers is then to restore connectivity between human behaviour and the very idea of the natural hydrological processes around out homes, on our streets and in our parks. Given the vast ingenuity humans have put on taming and controlling rivers throughout history, the possibilities are enormous if people can now become inspired to find equally creative ways to

coexist with river systems.” (May 2006)

This statement addresses the social and infrastructural connection with the urban water system and the water within the urban environment before it is released into urban river systems.

There is importance in the purification and addressing of the various parts of the urban water cycle, improving water quality from as early as possible and increasing the exposure and interaction of people with these systems in order to raise understanding and awareness.

Dealing with water from the urban environment before meeting the river system is a consideration and intervention strategy which needs to be taken into consideration when considering the low stormwater quality entering the site from the industrial area.

The focus of the intervention falls on the purification of the river system and the importance in the various processes and ecologies which have been destroyed or fundamentally impacted by the urbanisation of the surrounding areas.

The environmental habitat functions on many levels with a number of connections which enable it to be a self-sustaining system. These connections and processes will need to be understood in order to be able to rehabilitate them. The level of connectivity in a landscape is determined by the strength of the interactions between ecotones, the continuous flow and exchange throughout the landscape, “the antithesis of fragmentation”.

(Harrison 1996 cited in May 2006)

River corridors and riverbanks are linking elements between green spaces in the urban environment, they enable the movement of plants and animals in varying habitats with a constant supply of accessible water. The importance of the riverbank as a threshold as well as a connection between the river and land habitats surrounding it, which in the case of an urban river system, would be the area where the opposing environments are brought together.

The ideal connection of the river system and the surrounding environment in a riparian zone would need to support a diverse variety of amphibious species and wetland plants, achieved through the alternation between flooding periods and dry periods. This fluctuation in water levels and volume is responsible for the distribution of nutrients between aquatic and terrestrial habitats. (Ward, Tockner and Schiemer 1999 cited in Cengiz 2013)

The importance of the riverbank within the ecological system of an urban river, as well as in the social aspect for the design of publicly accessible riverfronts cannot be overstated and the design intervention will need to take into consideration the delicate role that the riverbank provides and how the intervention can enable, enhance or contribute to the ecological significance of the area.

Dealing with the river itself, the flow of water and hydrological connections within the flow of the river are fundamental to the ecologies, habitats and

processes occurring in the river system, there are three forms of connectivity:

Lateral Relationship

Connection between watershed and river including the role of animals, plants, sedimentation, delivery of nutrients and other organisms in the relationship between water and shore.

Longitudinal Relationship

The relationship between upstream and downstream concerning the migration of species, water quality and the flow of nutrients.

Vertical Relationship

The subsurface habitats which occur in a river system.

The fluctuations of water level in river systems is fundamentally important to the ecology, but flooding is an important element to take into consideration when designing for interventions in close proximity to the water system.

The riverbanks are considered to be the regulators of flow, its ability to absorb the changes in flow and the various exchanges between river, riverbank and floodplain. ‘Hydrological connectivity: the transfer of water between the river channel and the floodplain or between surface and subsurface compartments, has major implications for biodiversity patterns as well as plays an important role in structural succession patterns. (Ward, Tockner and Schiemer 1999 cited in Cengiz 2013)

The influence on the hydrological

connectivity within a water system due to human intervention will have a detrimental effects on the environment and needs to be carefully evaluated.

The similarity between landscape, ecological and hydrological connectivity is the protection of undisturbed river environments, limiting the influences of fragmentation, impermeability, channelization and the overall influences of the urban environment and the effects this may have on the ecological functioning of the river system.

The higher the connectivity the lower the impact. (Pringle 2003 cited in May 2006)
The approach to the design and development within a riparian zone and on a riverbank will require the preservation of both the river bank and the floodplain and the promotion of various levels of connectivity, ecological ly and hydrologically.

Interventions need to take into consideration the impact they will have on the various connections within the river system and technical and design resolution will need to be of minimal, if any, disturbance to the system and its ecologies.

SOCIAL CONNECTION

Connection: People, Communities and Societies

In terms of the human element, there are certain social aspects which will need to be addressed through the connectivity of the intervention. Urban Rivers historical function as a natural boundary for racial segregation is clearly evident in the contextual analysis of the chosen site.

previously segregated black and coloured communities of Eersterust and Mamelodi together with the predominantly whiter community of Jan Niemand Park. (May, Klein and Kashchenko 2004 cited in May 2006)

The coloured township of Eersterust was separated from the developing white community by placement across the Moreleta Spruit.

The industrial area of Silverton also served as an infrastructural boundary between white, black and coloured communities. Both elements are clearly defining characteristics in the urban city layout. Social understanding of the site is explained through the spatial logic of the apartheid city model, where racial segregation was defined by the infrastructural barriers of main road routes, railway lines and industrial areas, as well as the use of natural barriers such as rivers and mountain ranges.

Eersterust was considered to be a residential township which was created on the periphery of the city for non-white residents, located at the furthest point away from the CBD and buffered from it through the industrial area of Silverton. (Breed 2012)

Era Brick Works quarry is an industry which was used to enforce the old apartheid legacy, the intervention is intended to transform this site from a barrier between communities into an area of connection, drawing the

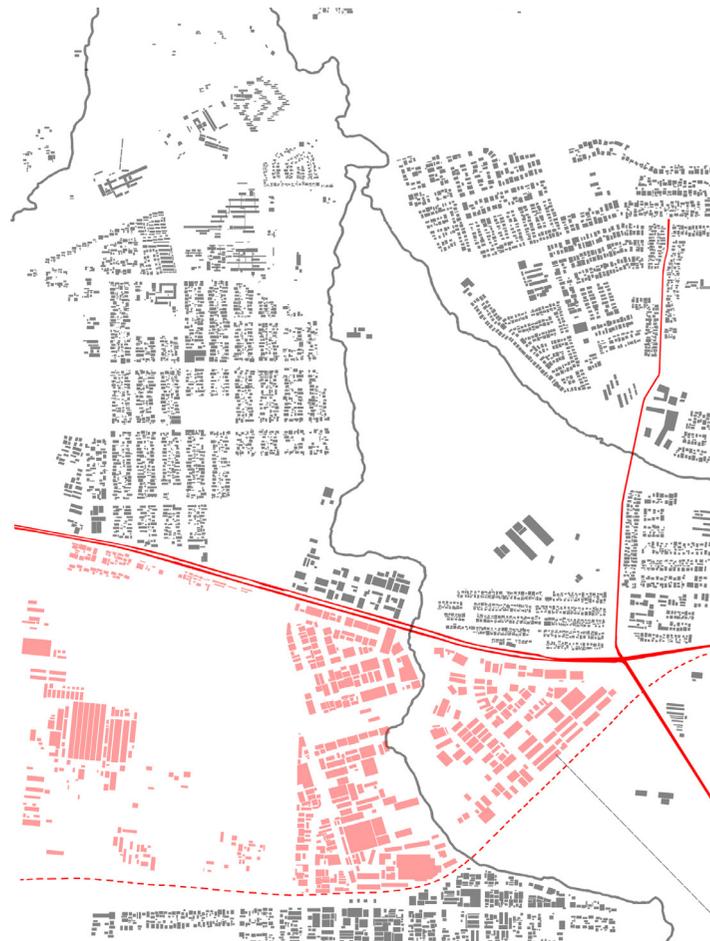


Figure 2.3.2: Surrounding Infrastructural Boundaries (Author, 2015)

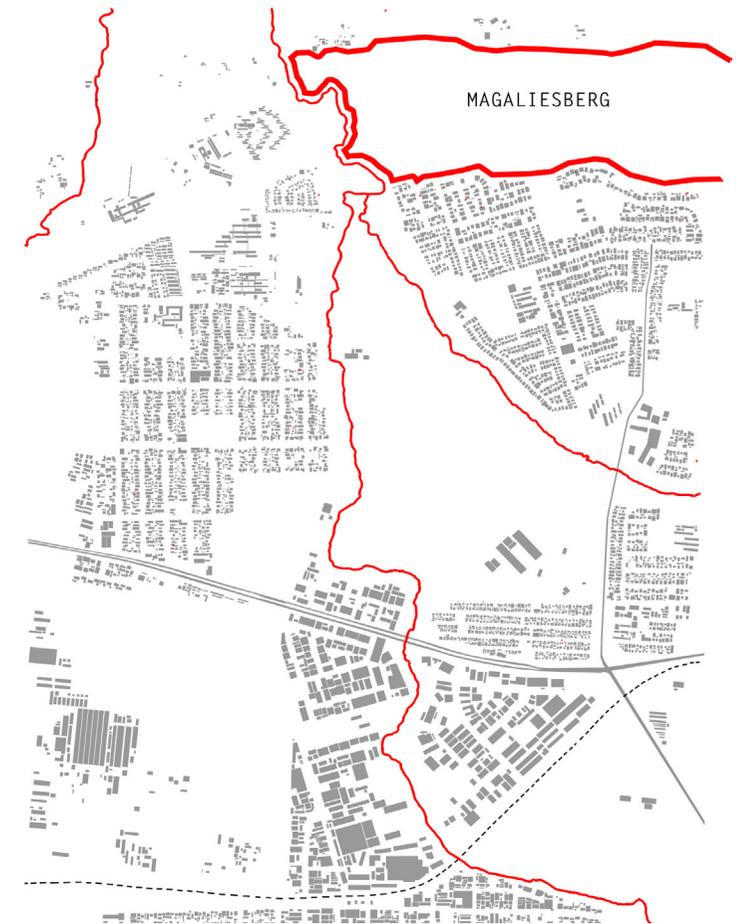


Figure 2.3.3: Surrounding Natural Boundaries (Author, 2015)

APARTHEID CITY MODEL

Understanding the urban structure and layout based on the use of infrastructural and natural barriers to separate people according to class and race.

The Apartheid city model was designed in such a way that races and classes were separated from one another through the spatial configuration of the city and its elements.

The use of high industrial and commercial barriers as a buffer between areas of conflict created a distinct separation in the urban environment.

The combination of natural and infrastructural barriers for the means of separation and segregation is a strong link between the urban environment and our South African history.

The design intention of the author is to transform these barriers into public spaces for social and natural cohesion and healing.

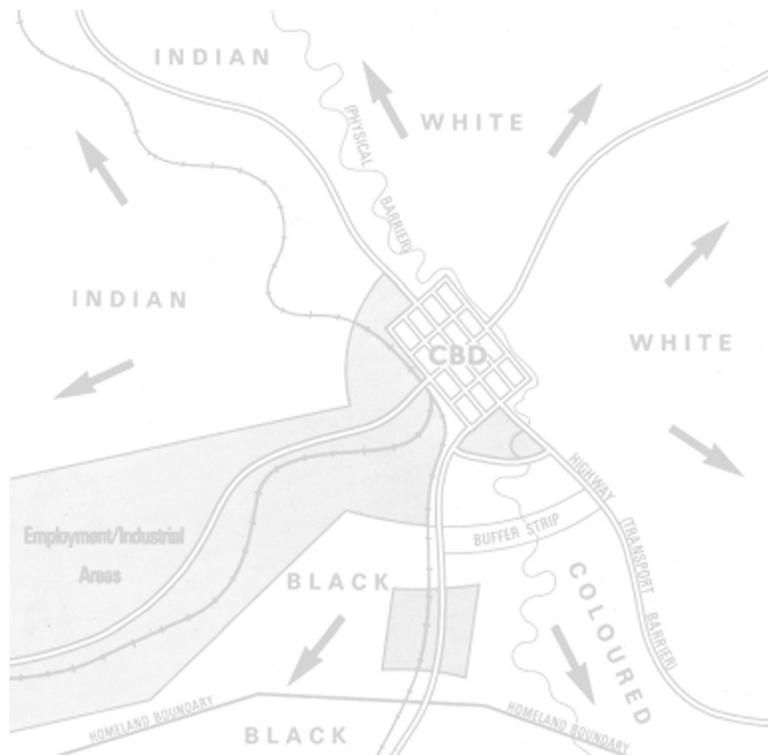


Figure 2.3.4: The Apartheid city model (Ceasar Lopez, 2011)

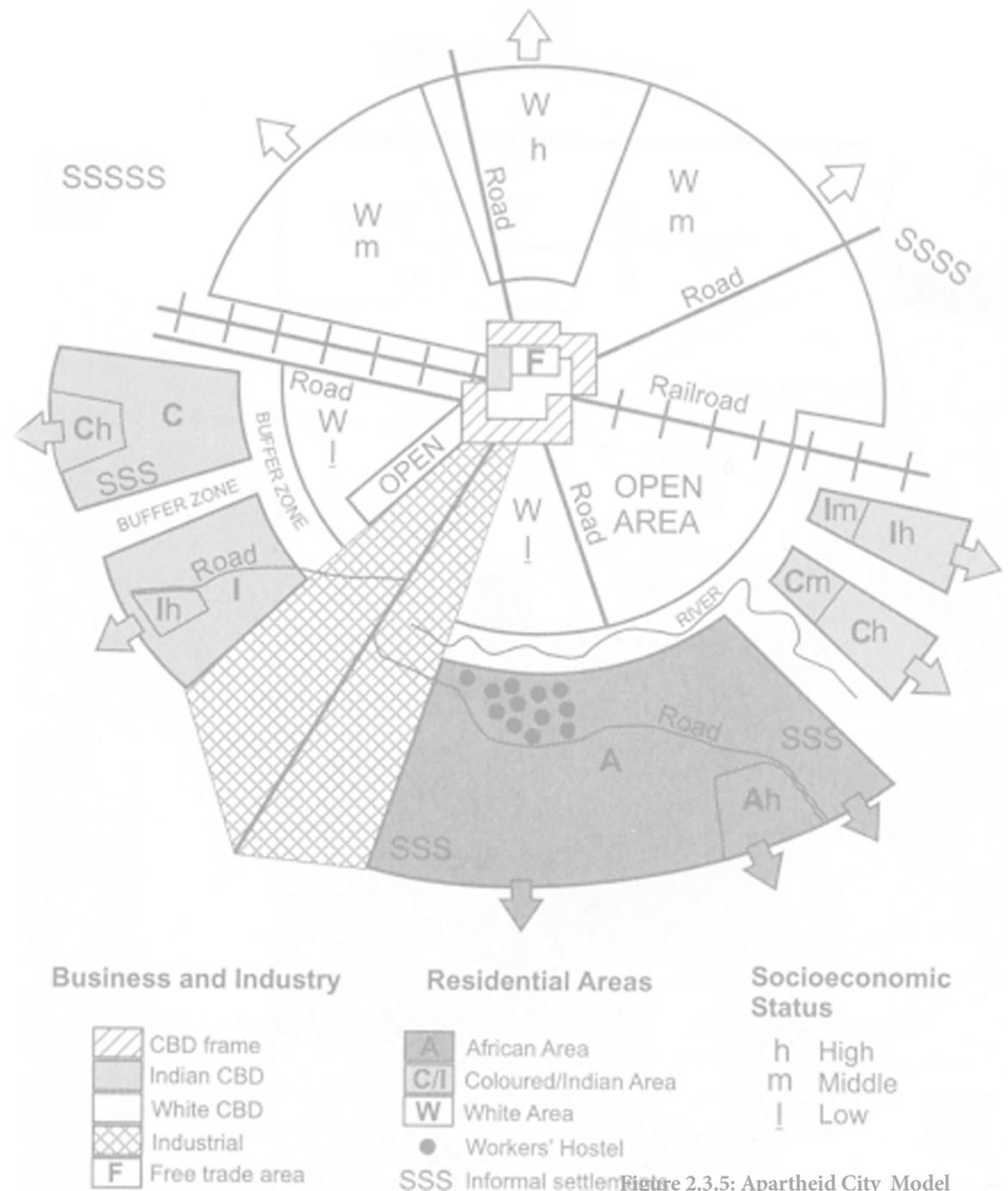


Figure 2.3.5: Apartheid City Model (Ceasar Lopez, 2011)

CONNECTING PEOPLE AND THE NATURAL ENVIRONMENT

The design needs to promote the relationship between river system and user, human interaction and interest in ecosystem integrity will raise awareness of the complexity of urban river systems.

The development of this connection through understanding will ease the degree of tension existing within the urban environment between cultural and ecological environments.

The development of urban rivers as public space will become the connecting element between the urban dweller and the natural processes which are hidden by the built environment, as well as the history of the development and establishment of the cities. The social connection of man and the environment requires a cognitive approach, the acknowledgement that humans are an integral component of the ecosystems on both a local and global scale.

Human presence and involvement in the natural environment needs to be understood and taken into consideration as well as acknowledging the degree of the consequences of their actions on the ecological environment and how to minimise these impacts.

The education of water systems should communicate the social cues for sustainable use and behaviour surrounding the ecological environment, creating a sense of stewardship in man concerning nature.

Concerning urban river fronts and

their cognitive connections between the ecosystems and daily lives of urban residents, there are three main recent approaches to design interventions.

The overall outcome is to reverse the anthropogenic perception that man is dominant over nature and that the world is centred around human existence and the assertion of human dominance over river ecosystems, achieved through the awareness of the complexity and interdependence of all parts of the interrelated systems. (Hey 1994 cited in May 2006)

Pedagogical Restoration Plans

This approach is concerned with the education and teaching of the natural environment, the inclusion of elements within the landscape which are responsible for educating urban dwellers on the complexity of the ecological river systems and processes.

Riverfront Museums

These interventions are responsible for the introduction of the urban dweller to essential concepts which make up the urban river system such as watersheds, water quality and the water cycle. The importance is experience of these elements within the urban environment.

Exposing the processes that involve the urban river systems which are hidden by the urban environment educate people on the wastewater treatment systems as well as the direct influence that certain elements of the urban environment will have on the river system and ecology,

for example, the relationship between increased impermeable surfaces and the resulting increase in urban runoff and flooding. The connection that these museums create through social and natural aspects of the city and its region, strengthens the connection through the cognitive relationship between the daily lives of the users and the water processes.

The location and significance of the sites for the creation of such interventions creates a symbolic link between human intrusion on the natural environment and the importance of the natural resource.

'Eco-Revelatory' Design

The creation of artistic elements within the architectural interventions and infrastructure, redesigning the built environment in a way that exposes and creates an awareness within the user of the daily role that the urban environment and its inhabitants play in ecological processes and the influence that they have on them.

This will forge new links and connections between the cities and their hydrological systems. (Spaid 2002 cited in May 2006)

PEDAGOGICAL RESTORATION PLAN CASE STUDY

The Don River Restoration Project, Toronto, Ontario

The movement and transition of habitats and natural experiences along the Don River between marshes and deltas, more formally designed landscapes for recreational use to floodplains, meadows and forests as a means of understanding the complexities of river systems and their surrounding ecosystems holds its value in education through the interaction between people and their natural environment.

There are a number of educational facilities located along the river such as the research station where people can learn about the functioning of the river system throughout the watershed.

This station provides education in terms of how the impact on water hydrology can directly influence the complex habitats for wildlife within the river system.

The river was rehabilitated and designed to enhance the emotional and historic connection between urban and natural environments, the user and the river. (Hough 1995 cited in May 2006)

The Don River Restoration plan is focused around the protection, regeneration and stewardship for the polluted and neglected river system that has significant natural heritage value.

The watershed plan is intended to guide municipalities, provincial and federal governments in their policies for environmental protection, conservation and regeneration within the context of land and water use in the planning of future urban growth and development.

The project is directed not only to government but to local land owners addressing environmental management practices and stewardship.

The plan outlines three strategies for approach to the river restoration and regeneration project which are well aligned to the intention of the authors landscape intervention for the Moreleta Spruit. (Kelly and Cave n.d)

Build, Re-Build and Retrofit Communities to Restore Water Balance and Improve Sustainability

This approach deals with the flow regime of the river system, this aspect of the plan needs to be implemented during the redevelopment and infilling strategies of urban development, the retrofitting of the existing built environment as well as the development of the greenfield areas.

The intention is the balancing of the flow regime through stormwater management to reduce the flooding and erosion damage during peak flows while maintaining

an adequate base flow to maintain river ecology.

The support, protection and regeneration of the aquatic and terrestrial habitats is an important aspect of the project plan. The redevelopment throughout the watershed will provide for a number of other opportunities and improvements within the natural environment including the protection of existing green space and cultural heritage structures, water quality improvement as well as improved watershed functions and ecological processes.

Regenerate the Aquatic and Terrestrial Landscapes

Strategies and interventions have been incorporated in the watershed to improve water quality, the planting of trees and aquatic flora for habitat creation and rehabilitation, removing of flow barriers hindering the movement of aquatic life as well as improved human activities along the river system to promote use and experience of the natural environment.

However, continued urbanisation and development place additional pressure and have increasing negative impacts on the watershed ecosystems, the approach to increasing impacts is the increased interaction of the community as well as funding for the continued interventions for restoration.

Engage the People of the Don

The inclusion and creation of human and nature interactive events have been incorporated such as Paddle the Don

and others, in conjunction with the major naturalisation and brownfield rehabilitation projects which have taken place in areas alongside the river system, was successful in its intention to engage the community and provide wider awareness of the river system.

The interest which is sparked through these interventions needs to be capitalised upon as a starting point of reconnecting the people with the river system through understanding and awareness which will in turn lead to the voluntary transition of local residents to use sustainable practices which will aid in achieving the vision for future river city.

Stewardship and outreach education is important to build the understanding of the links between the actions of the surrounding landowners and the health of the riversystem. There is an importance in the inclusion of the youth in the education of natural resources, encouraging them to explore the natural features within the watershed will form a connection with the natural environment from a young age, encouraging stewardship. Sustainable practices in schools and at home will aid in youth education. (Kelly and Cave n.d)

Stewardship and Outreach Education

One of the main themes in the restoration project is the need for initiatives to increase awareness and understanding of the individuals, economic and commercial sector as well as the government, regarding their contribution to regenerating a healthy and sustainable watershed.

RIVERFRONT MUSEUM CASE STUDY

Fairmount Water Works Interpretive Center (FWWIC), Philadelphia, Pennsylvania

The educational initiatives highlight the urgency of the shift to sustainable practices not only for the reduction in present impacts on the watershed but making people aware of the market for innovative community designs and strategies for a more sustainable community approach as populations continue to rise.

In order to promote the stewardship concerning green spaces and natural areas, there is a need to inform and educate people on the encroachment of floodplains and vulnerable habitats through activities such as dumping, mowing and incompatible recreational uses.

The best management for individual terrestrial and aquatic habitat regeneration is through planting, reduction of invasive species and maintenance as well as the promotion of the natural and cultural heritage existing within the water system.

The approach to each group of individuals will target the specific impacts that each results in and focus on the sustainable practices and education in those specific areas. Homeowners will be educated on more sustainable practices within their homes, green building strategies and community movements in a sustainable direction, property naturalisation, at source stormwater control, water and energy conservation.

The commercial, economic and construction sector will be educated on the new technologies for sustainable development in terms of stormwater

management, water and energy conservation, increased education on erosion and sediment control practices for site construction and the best approach to restoration of a site after projects have been completed. (Syring 2008)

The historically significant site is made up of a complex of neoclassical buildings which were once responsible for the housing of steam engines, waterwheels and turbines that transported water from the Schuylkill River to the reservoir on Fair Mount, providing water for the surrounding urban environment.

The City of Philadelphia was the first large American city to regard the safe delivery of water as a municipal responsibility and the water works plant was established after an outbreak of Yellow Fever which was believed to be caused by unclean water. (A View on Cities 2015).

The water works was a significant engineering project which was responsible for the attraction of many tourists, it tells the story of the Schuylkill River and its human connection throughout history, renowned for the integration of nature and technology.

Historically it received much acclaim and was the model for a number of similar projects throughout the US, however it was not only ahead of time engineering system that was responsible for all the attention, it was the Greek Revival structures designed to house the inner workings of the systems which received equal amounts of praise.

The Fairmount park was located directly above the buildings of the water works, one of the world's largest urban parks which was designed as a means of protection for the city's watershed as well as providing a space for recreation for the city.

The buildings have been used in the showcasing of the ecological and engineering significance of the provision of water to an urban population. There are a number of exhibitions where people are able to gain an understanding of watersheds and the impact and influence that the urban environment and its resultant pollution has on them.

(A view on cities 2015)

The fundamental success of this museum is the location of the buildings and the possibility for visitors to look inside the real workings and machinery and through a series of windows, watch the river rushing past the buildings. The lower lying structures have been designed to be submersible when the water level rises, or easily removable. Educational experiences are enhanced by the constant reminder visually, that the visitors are in the watershed. The water works is host to a number of events centered around the education of the importance of urban watersheds and how to take care of it. Events include workshops and summer camps and has won numerous awards for its educational outreach programs.

The exhibitions have been designed to be highly interactive, with the use of modern day technology for the simulation of rainstorms to follow the path of the water flow through the watershed or to follow the water cycle from the river to the point of domestic use.

The understanding and connection to the modern day user is successful in education and awareness creation. (A view on cities 2015)

'ECO-REVELATORY' DESIGN CASE STUDY

The Living Water Garden, Chengdu, China

The water quality education and green space park was designed by Betsy Damon in association with her foundation, Keepers of the Waters. Centered around the relationship between water and life, the park nourishes and educates the citizens through its design and purpose.

Designed to purify water from the Fu-Nan River, chemically polluted from the life of a large industrial city, the pollution which is slowly but surely responsible for the diminishing water quality in urban rivers, through a low technology purification system. The park makes use of exposing naturally occurring water purification systems which are often invisible and hidden from the human element and urbanised environments.

The Living Water Garden was designed in a way to sustain life, to show nature and water working together for the purification of water and through the integration of public space and human interaction with the systems, people are made aware of their relationship to water.

Water is taken from the River system into a settling pond, where natural systems are responsible for the removal of pollutants. Larger materials settle to the bottom of the pond while the water passes over a stony area to allow for aeration before passing through a vegetated area or wetland area for further absorption of pollutants through various plants.

The water is then designed to travel through a number of sculptures or flow forms which imitate nature very precisely

to allow for the optimal movement of water for the formation of vortices. These vortices are the basis of most life forms and the motion is responsible for the cleaning of water.

It further flows into a series of ponds, the water is of standard to sustain life so the ponds are populated with fish and water plants which further aid in water purification. The incorporation of a second series of flow forms cleans the water to the point where it is of quality for human interaction and has been included in the childrens play area of the park.

The Living Water Garden has been designed so that the water is constantly visible and the inclusion of water monitoring stations and environmental education centre provides for exhibitions and programs for all citizens for education on water systems.

The flood walls of the garden have also been designed with an interactive intention between users and the river system.

The majority of the purified water is returned to the river system, however this is not enough to clean the river, the garden is symbolic and encourages learning, and is a constant reminder of the importance of reclamation of the river.

The users are drawn in to the Living Water Garden through the design of two smaller neighbourhood parks which honour the cities relationship to the river, gently leading the users to the river with

places to rest and relax within the urban environment.

The strong relationship between the user and the river is an important point in this park, designing an entire urban park based on the processes and systems of water revitalization. The levels of interaction created by walkways passing through wetlands, interactive riverbanks and all stages of water purification are able to be seen, touched and understood.

The choice in form generation allows for human experience as well as ecological efficiency to follow the flowing and feeding of surrounding ecosystems.

There is a sense of wholeness and integration is the key for public experience of the space and the understanding of the complexity of natural water systems and the role it plays in their lives.

ECONOMIC CONNECTION

The industrial areas were used as infrastructural boundaries separating communities of different classes and race, Era Brick Works was one of the industries used for defining the barrier between Eersterust and the white communities to the south.

Though historically established due to the presence of clay as a result of the proximity to the river, as social organisations developed and become more complex, the location of the quarry in relation to Eersterust and Silverton became involved as an industrial means of segregation.

The quarry made use of natural materials for production, the same approach adopted by the previously discussed masterplan of the Eersterust Urban Vision Group, including the fibre processing plant, ceramic production and apiary.

The downfall in this approach however is that the significance of the river system has not been taken into consideration, and the use thereof as a means of processing and production will contribute to the social interaction and provision for the surrounding communities, a connection between the economic, social and natural environments.

Although the direct connection deals with the immediately surrounding communities, in terms of growth and development on an economic level, neighbourhoods cities and even regions limit their growth if residents provide services exclusively for each other. There is a necessity in the provision of products to be sold to people and communities

beyond their own as a means of income for the producer. The additional income is a means to reinvest in new production facilities and raw materials, this income provides a base from which the economic aspect of the society can progress.

The design intervention needs to be of such a nature that public space is created through the processes and products of the incorporated industries, exposing the user to the use of natural materials in the industrial processes in a manner with which they may interact.

The implementation has the potential to be done on various levels, including a number of different social organizations, as a means of bringing external purchasers to the place of intervention, this allows for the establishment of an internal market which facilitates internal transactions, production of goods and services for both the residents of the community and the external purchaser. (Ellis 2011. para.6)

Exposure to the natural environment has certain positive effects on the health of the person exposed to it, research regarding this connection has resulted in the identification of 5 mechanisms of action in which this link between nature and health manifests itself.

In rehabilitating the quarry, the creation of an expansive green space within the built environment which is catering for the connection between man and the natural environment will ultimately have an underlying positive effect on the health of urban dwellers that come into contact with the space.

RELATIONSHIP BETWEEN NATURE AND HEALTH

The five mechanisms of action through which nature has an effect on human health are:

Recovery from Stress and Attention

Fatigue

Even through brief exposure to nature there is a positive impact on physiological processes for example:

- Positive impact on mood and cognitive functioning
- Increase in attention and concentration
- Improved self-discipline and aggressive behaviour due to increase in concentration

Stress is caused mainly by social and environmental factors which have a significant physiological impact due to the continuous adaption of physiological functions.

The result of chronic stress is that certain processes are disrupted which compromises the immune system, as well as plays an important role in the development of a number of physical and mental illness and health problems.

There is an importance in the presence of accessible green space within the urban environment to allow for a time of recovery with restorative effects on users of the space, through the removal of the individuals from the urban environment.

Design and Spatial Considerations

The characteristics of the environment will determine the ability of the landscape to automatically attract the user's attention and encourage a positive reaction.

These characteristics include a level

ground surface, considerable spatial openness, presence of pattern or structure, curving sightlines as well as the presence of water.

Encouragement of Exercise

There are certain public health implications regarding the health risk associated with a lack of exercise. When designing for a community or neighbourhood, there should be a consideration in the design concerning the idea of exercise and how well the landscape lends itself to exercise and physical activities. The presence of an alternative environment allows for a mental break from the urban environment and associated stress, encouraging users to exercise more often and for longer periods of time. The more appealing and diverse the environment, the more attention is directed towards the landscape and away from physical signals of fatigue and exertion.

Design and Spatial Considerations

The conflict between pedestrians, joggers, cyclists and vehicles in the urban environment discourages people to exercise, this means that the site, in order to encourage exercise needs to minimise the dominance of vehicles to optimise and promote pedestrian movement and alternative forms of transportation and activity. Safety, appeal of the landscape, accessibility and surrounding land use are important indicators which need to be taken into consideration and addressed when designing a space which lends itself well to exercise.

The routes which are designed for exercise purposes need to take into consideration

time constraints and distances for various users, as well as the experience of the landscape which will take place along each route.

Facilitation of Social Contact

Social connection is one of the aspects addressed in the approach to the nature of the design intervention, the promotion of public space and facilitation of social contact is essential for the success of the intervention. The presence of green space strengthens social ties within a neighbourhood through the development of the surrounding people, neighbourhoods and communities.

The reinforcement of social ties which contribute to strengthening the community are a result of increased face to face contact. The lack of social contact has a negative effect on human health as it results in a lack of support, security, and mental fatigue. Within the urban environment many people are reliant on public space for social contact. This theory was summarised from: (Health Council of the Netherlands and Dutch Advisory Council for Research on Spatial Planning, Nature and the Environment 2004)

Design and Spatial Considerations

The design of public spaces which promote social contact are fundamental in public interventions, the presence of trees encourages people to linger and gather in certain areas through the provision of shade.

Through the promotion and ease of access to public spaces people, immobility and lack of transport will no longer restrict

use of public spaces.

The incorporation of shared gardens or group responsibilities within public spaces promotes collective maintenance which is highly important for social significance and cohesion within a community.

Stimulation of Development in Children

The environments to which children are exposed has a direct influence on the development of attention, self-discipline, psychological resistance, cognitive, motor and socio-emotional understanding.

Intensive learning and playing experiences are necessary within an environment which encourages the exercise and physical activity of children, assisting in motor development, cognitive, emotional and social integration.

Age groups need to be taken into consideration concerning activities, safety, parental supervision etc. There is an importance in the understanding and exposure of children to experience change within an environment that is familiar to them. In a natural environment they are able to experience this while being exposed to the significant relationship between man and the non-human environment.

In an alternative environment the stimulation of the imagination is almost an automatic reflex to the change in surroundings. A natural environment is more attractive due to the greater variety of elements with which to interact creating a more stimulating experience.

The removal of a child from their immediate environment is an important mental break from the constant living environment, it may also act as a buffer during stressful events as well as providing the child with a sense of freedom.

Design and Spatial Considerations

The incorporation of a savannah like landscape appeals to the innate, instinctive feeling of familiarity and safety, the alteration of landscapes will aid in the contrast between the familiar and the unknown providing for the child's sense of exploration and imagination.

The planting choice will provide for the relationship between change and familiarity through the choice of planting emphasising seasonal change and alteration throughout the year.

A variety in environments is necessary through use of various forms, materials and colours, catering to the sensory experience and development in children. Active and educational forms of play equipment will create exciting environments through the incorporation of many natural elements which will challenge children in a variety of ways and levels of complexity.

Provision of Opportunities for Personal Development and Sense of Purpose in Adults

The experience and interaction with the peaceful environments created by nature promotes a sense of purpose in people, a space allowing for reflection, peace and solitude aids in coping with stressful events.

The removal of individuals from the urban environment provides them with a stress free space to reflect and deal with the pressures of life in the presence of nature and the absence of social pressure.

The contemplative effect that nature has on individuals encourages individuals to address their deeper convictions and values, discovery and naming of their goals in life which will manifest itself in a sense of place, a relationship is formed between the natural environment and the individual through the identification of a specific area at where one feels at peace and at rest.

Design and Spatial Considerations

The encouragement of exercise brings people to places removed from stressful urban environment and allows for the escape from every-day problems.

The interaction with water is a soothing and meditative activity, contributing to both exercise, nature and man interaction as well as freeing of the mind.

The three basic needs which need to be considered and incorporated to achieve personal well-being and development are competence, the understanding of natural surroundings, systems and processes.

Autonomy, the idea of self-governance, taking control of ones own life and making decisions regarding future purpose and goals and lastly, relatedness, experiencing a place of understanding, order, freedom and connection.

It is important to design a space in such a

manner stems are exposed so that man is aware of how man and individuals fit into the greater scheme of the environment as a whole.

This theory was summarised from: (Health Council of the Netherlands and Dutch Advisory Council for Research on Spatial Planning, Nature and the Environment 2004)