# CHAPTER 2: APPROACH TO SMALL SCALE URBAN RIVER SYSTEMS

## INTRODUCTION

River Cities were established along the banks of major rivers which were, and are able to, provide for the development and sustainability of larger populations. However, cities such as Pretoria, which were established along the banks of smaller rivers, relied on the water resources in very much the same way as larger scale rivers, but in a more minimalistic manner. These smaller rivers were able to sustain the smaller initial settlement populace in terms of a water source for irrigation and domestic use. As the settlements developed and established into cities, the water sources were no longer of sufficient volume and alternative water sources were sought.

Through the loss of significance in terms of human survival, the urban rivers took on a more aesthetic role in the progressively urbanised environment.

The upkeep and maintenance of such river systems were not of as much importance as that of river systems which were responsible for the existence and sustainability of an entire city, resulting in the negligence and degradation of the natural corridor, compromising all ecological and aesthetic value still held by the small scale rivers.

Through the lack of activity and significance, the river systems are reduced to urban environment stormwater management outlets and a pollution channel removing waste from within the urban boundaries. Restricted access, lack of maintenance, little to no ecological, social and economic value and safety concerns have transformed these once pristine natural resources into scars running through the environment as a visual reminder of the dominance of the urban environment over the natural.

As the rate of urbanization and overpopulation puts strain on the limited resources at our disposal, the reality is that these resources will eventually run dry and it is the human race that will have caused their own demise. This reality triggered the movement in the direction of rehabilitation and restoration of city sustaining river systems, however it is no longer viable to only focus on selected river resources. Small scale urban rivers may not be responsible for the survival of greater populations however, managed and educated approaches to even a minimal amount of water could turn previously neglected corridors into self-sustaining resources with the potential to benefit millions.

The contemporary cultural and design approaches to urban river connectivity are almost diametrically opposed to the ecological and hydrological notions due to the fact that they promote human interaction with the riverfront, which is controlled and mediated by the built environment. This approach is solely focused on the interaction of man with the natural environment and it is this manner of interaction which is responsible for the disruption of the biophysical connectivity, not only along the river but between the river and the shore through the crossing of banks with bridges and roads. Rivers are channelled and shored up in order to prevent flooding as well as the incorporation of landscaping for recreational use, both interventions are responsible for the destruction of the natural environment, including the systems and processes on which the river relies.

From an ecological point of view, this is an extremely poor approach due to it being an artificially focused design which is responsible for the alteration of hydrology and ecology of the river in order to best suit the economic and aesthetic values of the city. (Otto, McCormick and Leccese 2004 cited in Hay 2006)

The approach to the small scale river systems will be focused first and foremost on planned rehabilitation and restoration of the urban river, the recovery of multiple lost or deteriorated ecosystem services, the improvement of water quality and ecological systems, and processes surrounding the natural river corridor.

The design importance lies within the manner in which these rehabilitation and restorative approaches to the river system are executed, intending to create a connection between the urban and natural environments. It is through exposure and understanding that people will recognise the importance, significance and value of the existing water systems.

Increasing accessibility and education of such resources will slowly but surely alter perceptions in the greater population for the preservation and protection of the dwindling resource. The apparent benefits of rehabilitation will aid in human well-being in ways such as, health, economic value, life quality and contribution to regional renewal.

The value that lies in the ecosystem services are in the handling of a wide variety of sustainability challenges such as the demands of land use planning, agriculture, carbon and microclimate management as well as the management of watersheds, biodiversity and tourism.

It is important not to lose the historical importance of water as a resource during the process of rehabilitation and restoration. The innovative design process will deal with the research, interpretation and creation of both alternative and contemporary ways in which the river is able to reclaim its value, through providing for the urban environment and population as a resource as well as its potential to shape the surrounding environment.

It is important to evaluate the urban open areas and green space systems regarding public benefit, such as protection from flood risk and flood plain management through specification of flooding area boundaries on river banks.

Meeting the increased demands for future population growth through the development of strategies which are responsible for the protection and preservation of landscape characteristics and alleviation in effects of rising populations and urbanisation pressure, will ensure the future presence of multifunctional river systems in the city landscape for future generations. (Cengiz, Smardon and Memluk 2011 cited in Cengiz 2013)

Photo 1.2.1: Church Square in the Early 1900's (Church Square, Pretoria, South Africa, 1905 WDL3016.png)

In terms of an urban river city, Pretoria would never be one of the first examples when competing with cities such as San Antonio, Boston or London, however, it was due to the presence a river system that the city of Pretoria was originally established.

The first inhabitants of Pretoria were settled in Church Square which is located approximately 4.8km from the Fountain springs which is the constant water source that Pretoria has been dependent on since the start of its existence and the only water source for Pretoria from 1855 until 1935.

The Fountains have yielded crystal clear, high quality water since their discovery, and continue to do so today. The Commandant-General of the Transvaal Republic, Marthinus Wessel Pretorius, considered the abundant water supply and natural contours of the area and declared the area ideal for the establishment of a new capital, his motivation for registration was that the area was well suited to build a city with large and unlimited available area and water.

The two springs were located in the Fountains Valley on the Groenkloof farm, in the same dolomitic area that provided water from seperate eastern and western fountain compartments and which were divided by the Fountains Dyke. The springs discharged their water supply into the Apies River that flowed continuously and strongly northwards.

The presence of the Apies river played a

Photo 1.2.2: Apies River - Natural Environment. (L, van Vuuren, 2012)

Photo 1.2.3: Apies River - Urbanised (L, van Vuuren, 2012)

Photo 1.2.4: Apies River Original Reservoir (L, van Vuuren, 2012)

significant role in the choice of location for the establishment of the new city as an important trade and movement route to Delgoa Bay crossed the Apies River close by. The site had previously been a popular overnight stop for travellers and transportation wagons before the formal settlement of the town, due to its abundance in water and natural grazing areas for cattle. (Adams 2012)

The landscape drops approximately 50m in elevation between the fountain source and Church Square, providing a gravitational movement for water to Church Square. The water was directed into Church Square through the digging of a water furrow, which was the first municipal works of the new settlement.

The furrow was completed in 1855, followed by the construction of a holding dam at the springs. The construction was done hastily and required reconstruction a few years later, formalising both the dam and the channel. (450mm x 900mm).

Regulations were set in place protecting the water quality and maintaining equal distribution of water. No water was to be taken from the furrow before it entered the town and no pollution of the water was allowed through washing, dumping etc. As the settlement increased, so the maintenance needs on the water supply increased and a suprintendent was appointed and held responsible for water management.

The provision of water was the only service offered to the inhabitants, but due to the lack of stormwater management and the polluting of the water supply through waste water and sewerage dumping, private wells were dug on individual properties.

During the first British occupation in 1877, there was an increase in military and business opportunities, leading to an influx of the white population between 1877 and 1878. The sanitary conditions, which were already poor, were now no longer able to sustain the settlement and attempts were made to clean the furrows and water systems. Due to a lack of funding, conditions continued to deteriorate during the British military occupation.

The Transvaal Republic regained its inderpenedence in 1880 and resumed municipal management under the control of the magistrate and reporting to centraol government. There were continued complaints regarding the water supply and water furrows and attempts to improve the situation were minimal and relatively unsuccessful.

The discovery of gold in Johannesburg led to a sudden influx once again, which led to the mobilising of resources in the private sector through a concession policy. The concession for the supply of clean water for 50 years was awarded to Pretoria Water Works Company Limited in 1889. A new collection chamber was built in Fountains Valley, combining both water sources. From the collection chamber a steel pipeline was constructed to transport water and to feed the reticulation network. The town was occupied again in 1900 by British forces and the guiding principal was that only the minimum municipal improvements were to be made. Urgent alterations to the collection chambers were made and new steam pumps installed, supplying the military barracks with water. After peace was reached in 1902, a city council was appointed and held responsible for municipal development and improvements.

The steady increase in population and the expanding municipal area put strain on the water supply and distribution system. The springs were providing more water than required, but key components and infrastructure were lacking and the systems needed to be expanded once again, resulting in new storage reservoirs being built. The town exploited the constant water supply and at one stage, Pretoria was self proclaimed to be the most well watered town in the world. Water was running down each and every principal street and was used to irrigate the town, but the water demand was unrealistically high and needed to be significantly reduced.

In 1922 there was almost no restriction on domestic consumption and although the springs were coping with the water demand, the overexplotation of the resource would eventually result in the failure to meet the growing demand.

Water metering was introduced to manage the demand but the reduction in demand was minimal and as a result, the development of an additional water source to supply Pretoria was inevitable and urgent. The scheme implemented was the use of the Rietvlei dam and was commissioned in 1934. (Haarhoff, Juuti and Maki 2012)