CHAPTER 2

Theoretical Investigation

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2.1 Background: When did waste become a problem?

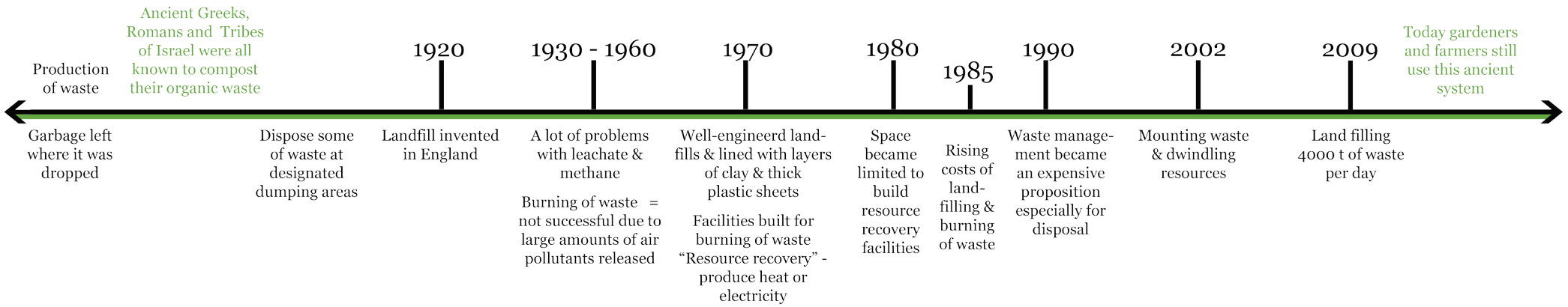


Fig. 10: Time line: History of Waste (Lerner, World of Earth Science, 2003 and Teacher's Notes. Modifications by Author, 2012)

In order to understand the current problem of waste, it is important to investigate how waste was managed through the years, the methods used and how the waste problem evolved.

The investigation was done on a broader scope, because waste is a universal problem and no one seems to grasp the value of waste and how to successfully solve the problem.

"People have always produced waste, but as industry and technology have evolved and the human population has grown, waste management has become increasingly complex" (Lerner, 2003).

Lerner states (2003) that four main methods of waste management existed throughout history, namely: dumping, burning, reuse and recycling and the prevention of waste.

In earlier days humans didn't worry too much about managing their waste; garbage was simply left where it was dropped.

However, "The process of composting organic or 'green' waste is an ancient one. The Ancient Greeks, Romans and the Tribes of Israel were all known to compost their organic waste…" (Teacher's notes, n.d:129).

It was believed that the Chinese were the first to develop larger composting sites for use in farming (Teacher's notes, n.d:129).

According to Lerner (2003), people began to dispose some of their waste at designated dumping areas as permanent communities started to develop. These "open dumps" are still being used in many parts of the world, but unfortunately they have many disadvantages – particularly in dense communities, because they represent the contamination of groundwater caused by leachate (a liquid containing toxic chemicals) that filters through the dump.

The landfill concept was invented in England during the 1920s. Leachate and methane were problematic during the early days of landfills, but since the 1970s landfills were well-engineered and lined with layers of clay and

thick plastic sheets. This resolved many of the problems such as leachate contaminating groundwater (Lerner, 2003).

The burning of waste has a long history but it wasn't very successful due to the high volumes of air pollutants released during this process. During the 1970s, however, facilities were built to use the burning of waste as "resource recovery" to produce heat or electricity. Space to build these facilities became limited and the public started to oppose this idea during the mid-1980s because of air-quality issues (Lerner, 2003).

The rising costs of landfilling and burning of waste raised concerns with the public. During the last 25 years this caused local governments to insist on the reduction of waste disposed by means of landfilling and burning and to seek alternative methods for the handling of waste. Such methods include the prevention, reduction and recycling of waste and are the least expensive methods of managing waste (Lerner, 2003).

The recycling of organic waste such as yard waste, food waste and broken down paper through the process of composting is seen as a form of waste prevention. The compost can be used to improve the fertility of the soil.

Unfortunately composting organic waste is not people's most preferred method and dumping waste at a landfill site is a much easier and more convenient method to get rid of unwanted waste.

"Waste management became a particularly expensive proposition during the 1990s, especially for disposal. Consequently, waste managers constantly seek innovations that will improve efficiency and reduce costs" (Lerner, 2003).

By studying the history of waste, it is clear that waste has always been a problem and is still an on-going and growing problem. The problem needs to be addressed by an innovative and creative solution.

The correct approach and a strong theoretical foundation will yield a feasible solution.

2.2 Literary investigation of core theoretical concepts

There are many theories available that can be used to approach the problem. Four theoretical concepts will be investigated in this dissertation namely Hedonistic Sustainability, Didactic Approach, Urban Ecology and Regenerative Design.

All four of these theories have the same goal in mind and that is to find new and exciting ways to address a problem and to attempt to change the 'World's point of view' regarding that problem, in this case, waste.

2.2.1 Hedonistic sustainability

The notion *Hedonistic Sustainability* was initiated by the Danish architect Bjarke Ingels. According to Cleary he is the founding partner of Bjarke Ingels Group (BIG) and "rated as 'one of the 100 most creative people in business' by Fast Company" (Cleary, 2012).

In order to have a better understanding of the meaning of *Hedonistic Sustainability* the theory was subdivided into Hedonism and Sustainability.

He-don-ism is the "pursuit of or devotion to pleasure, especially to the pleasures of the senses." "The ethical doctrine holding that only what is pleasant or has pleasant consequences is intrinsically good", the philosophy of *hedonism* and "the doctrine holding that behaviour is motivated by the desire for pleasure and the avoidance of pain" the psychology behind hedonism (The American Heritage Dictionary of the English Language, 2009).

According to Thompson (2000:2-3) *sustainability* means much more than only "a lasting and non-destructive way to live on this Earth"; it is about "using resources without diminishing their future availability or quality", "…living within our ecological means" and "…maintaining habitat and biodiversity."

Friedman states (2007:7) that environmental, economic and social aspects are equally important and need to be considered, as well as their interrelationships, in order to create "a well-balanced, *sustainable*" development "where all concerns are addressed…" (Refer to Fig. 11).

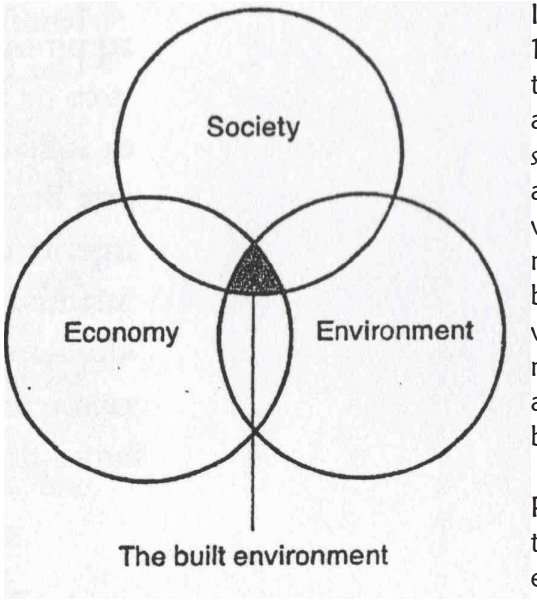


Fig. 11: Sustainable built environments are a combination of societal, economic and environmental considerations (Friedman, 2007)

In Charles Kibert's book (1999: 10-12 & 19-20) he expresses that "reduce-reuse-recycle" are strategies the realm of *sustainability* relies on. He also argues that even though humans will always use and abuse natural resources, "we will also be clever and adaptable, and we will increase efficiency, reduce material consumption, and adopt environmentally friendly behaviours."

People have the misconception that you have to sacrifice your existing quality of life in order to become sustainable and that a sustainable life is not as much fun as a normal life.

"What if sustainability actually increases life quality?" (Ingels, B. 2011) Bjarke Ingels follows the philosophy of *Hedonistic Sustainability* which represents the basic concept of pleasure being the only intrinsic focus for going green.

Sustainable development has to be a design challenge where the project is economically, environmentally, socially and aesthetically sustainable in order for it to be sustainable in the long-term.

According to Ingels (2011), sustainable life can be more fun than normal life and improves social cohesion by implementing *Hedonistic Sustainability* – taking the problem and turning it into something playful.

Hedonistic sustainability can be applied by designing didactic places (Refer to 2.2.2), taking the problem and turning it into a 'process of discovery', discovering the story of waste by allowing people to have hands-on experience and to take part in the recycling process. This will make people aware and teach them about the problem and how to make a difference in an exciting and fun way.

People have the desire for pleasure and therefore their behaviour might be influenced by making the 'experience' more enjoyable or pleasant.

If only people could realise or be made aware of the fact that "sustainability will improve their quality of life and human enjoyment" both pleasure for themselves and benefits to the environment can be attained (Ingels, 2011).

"The concept of hedonistic sustainability offers new hope that going green is not synonymous with deprivation" (Cleary, 2012).

2.2.2 A Didactic approach through storytelling

According to Random House Dictionary (2012) *di-dac-tic* is teaching or intending to teach a moral lesson.

A didactic approach through storytelling can be used to transform a space into a place with meaning (Buck & Ferrai, 2011:22) that will educate people about the problem of waste, the recycling of waste and the process of composting organic waste (Refer to 2.2.3.1).

Developing different "spaces that reveal stories as you walk through them" (Buck & Ferrai, 2011:22), taking 'the reader' on a journey of discoveries and exploration, encouraging 'the reader' to engage with and experience the waste recycling process, in an attempt to change their perception of waste.

According to Treib "[t]he didactic approach dictates that forms should tell us, in fact instruct us, about the natural workings … of the place." "A design didactically conceived, is both informative – possibly normative – and certainly directive. A Didactic landscape is supposedly an aesthetic textbook on natural, or in some cases urban, processes" (Treib, 1995:95-96).

Didactic landscapes can also be implemented to help promote educational and intellectual growth through stimulating play areas that also communicate the story of waste, where the experience and the story itself

becomes the teacher.

2.2.3 Urban ecology

In the book U*rban ecology: an international perspective on the interaction between humans and nature*, the authors define Urban Ecology as "the study of ecosystems that include humans living in cities and urbanizing landscapes. It […] aims to understand how human and ecological processes can coexist in human-dominated systems and help societies with their efforts to become more sustainable" (Marzluff et al, 2008:vii).

Urban Ecology's nature is interdisciplinary and focuses on both humans and natural systems; therefore the term "has been used variously to describe the study of humans in cities, of nature in cities, and of the coupled relationships between humans and nature" (Marzluff et al, 2008:vii).

The ecological approach to urban landscape design developed over time and today different ways to protect and enhance natural features and processes are embraced. This means that city dwellers can also enjoy and experience them (Makhzoumi & Pungetti, 1999:188).

Different methods to be applied within the Berea Waste Park to embrace natural features and processes will be investigated. This will form part of the story of waste being told and the experience thereof.

2.2.3.1 Using waste as resource

People need to realize what the value of waste is and its potential to be used as a resource. "Waste from one system may become a valuable resource for another system" (Birkeland, 2002:43).

People can "create valuable products from waste, making money and solving the pollution problem at the same time" (Gladstone, & Hesse, 1998:1).

According to Oelofse and Godfrey in the South African Journal of Science (2008:245) there has been a paradigm shift towards waste as resource, and a resultant change in the governance of waste from protection to re-use (Refer to Fig. 12).

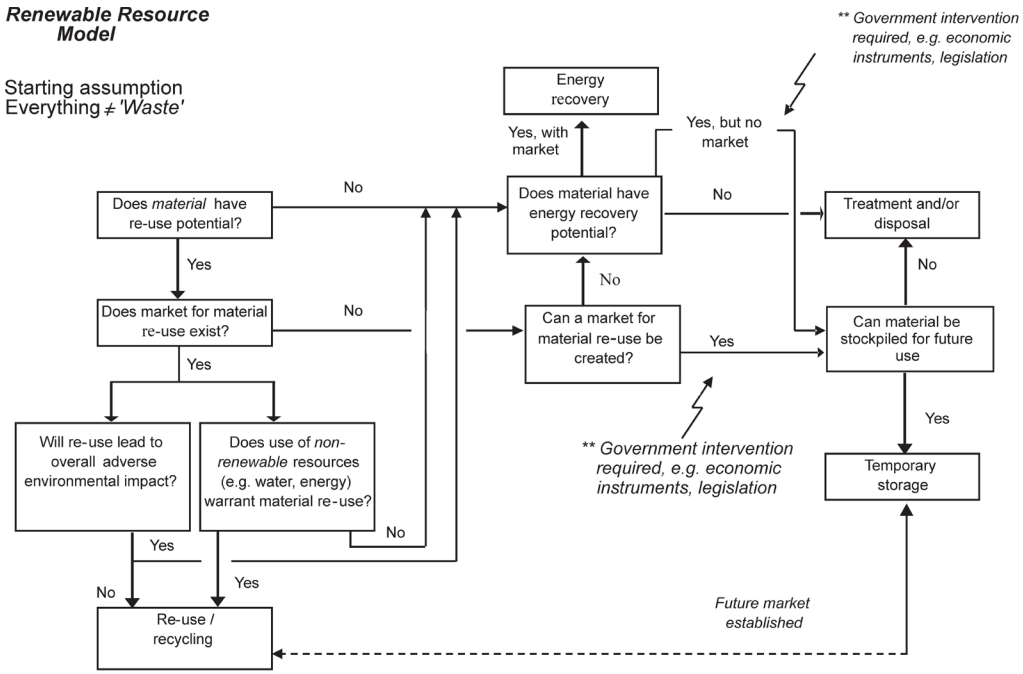


Fig. 12: Managing waste through a 'Renewable Resource Model' (South African Journal of Science, 2008:245)

Waste re-use can be encouraged by seeing materials regarded merely as waste as renewable resources and this can lead to a resource-based hierarchy replacing the waste hierarchy (as illustrated in Fig. 3).

There are different systems of using waste as resource, for example the recycling of organic waste through the composting of green garden waste and vermicomposting and the recycling of hard waste.

2.2.3.1.1 Recycling organic waste

Wherever there is human habitation, organic waste will be generated and according to Practical Action's article *Recycling of Organic Waste* the amount of organic waste produced is dramatically increasing each year. In the United States of America "as much as 50% - 60% of the total waste that is disposed into landfills is organic waste" (Edwards, Arancon, & Sherman, 2011:1).

The Teacher's notes article Composting and Organic Waste (n.d:133) states that "[o]ne third of the waste found in a typical dustbin could be composted; this would save time and money in refuse collection and save valuable space in landfill sites."

A limited amount of organic waste recycling facilities exist and this results in valuable waste being dropped at landfill sites. There are several refuse sites in Pretoria where the waste is also taken to landfill sites and not recycled. What a waste?!

There is a great need for 'refuse sites' that recycle garden and organic waste into compost. Composting, according to Teacher's notes (n.d:129), is a natural 'rotting down' process during which nutrients from organic materials are recycled.

Two methods of composting waste will be studied in the next section.

Composting green waste

The composting of green waste can be achieved by following the 'Windrow System'. The Windrow System starts when garden waste is collected and delivered to a waste park. The waste is shredded and chipped with a chipper. According to Teacher's Notes (n.d:132), the shredded waste is then stacked in long piles of approximately 5 metres high, called windrows.

The piles of waste are turned every six weeks to let air in, while being irrigated regularly, during which the waste is broken down through a natural process of rotting and decay. "Organisms such as bacteria, fungi and algae feed on the organic waste material and reproduce" (Teacher's notes, n.d:130). The air is very important for the micro-organisms to survive.

The final pile is sifted and the end-product is compost; the left-over material taken back to the beginning to go through the process again.

Fig. 13: Composting Green Waste at University of Witwatersrand by Servest Landscaping (Author, 2012)

A good example of the Windrow System is the composting facility at the University of Witwatersrand operated by Servest Landscaping (Refer to Fig. 13).

Vermicomposting

According to the Mosby's Medical Dictionary (2009) "*Vermis*" is the Latin term for 'a worm' therefore Vermicomposting is the process during which organic material is broken down by earthworms. The worms ensure the acceleration of the decomposition of the organic materials like food scraps and garden waste.

The end-product is Vermicompost: a "mix of worm castings and decomposed food scraps… full of beneficial microbes and nutrients" (CalRecycle, 2011).

Vermicompost also known as worm compost, vermicast, worm castings, worm humus or worm manure according to Dunn (2007) is very similar to normal compost except for the important fact that worms are used to turn the organic waste into a nutrient-rich fertiliser instead of using microbes and bacteria.

Two species of worms are usually used for vermicomposting because of their relatively high tolerance to environmental variations, these are Red Wigglers (*Eisenia foetida*) (Refer to Fig. 14) and Red Earthworms (*Lumbricus rubellus*) (Dunn, 2007).

Fig. 14: Red Wigglers (van der Walt, no date)

2.2.3.1.2 Recycling hard waste: glass, paper, metal and plastic

Recycling in the long run is beneficial to all living creatures on earth. It creates job opportunities, alleviates poverty, extends the life of landfill sites, reduces the costs to local authorities and it leads to a cleaner environment.

Apart from the above mentioned, one of the main benefits of recycling is that the amount of new materials required is reduced and because less raw material is required, it is further economically, socially and/or environmentally beneficial for materials that is costly to extract or to produce.

Hard waste can be recycled by providing litter bins marked specifically for each form of material such as glass, paper, metal and plastic. According to Gladstone and Hesse in their 'Reduce re-use recycle'-article, glass and cans are 100% recyclable (1998:3).

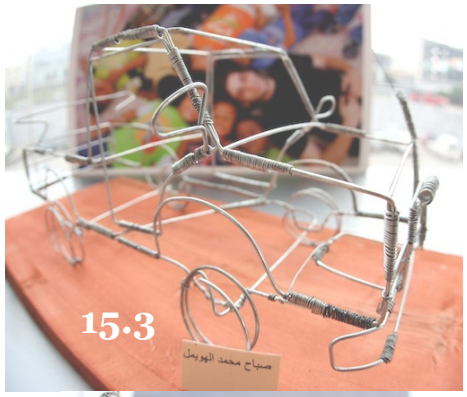
As a result, job opportunities are created by employing people to sort the unsorted waste into the different categories. Schools can also earn money by participating in the collection of recyclable materials and delivering it to allocated collection points.

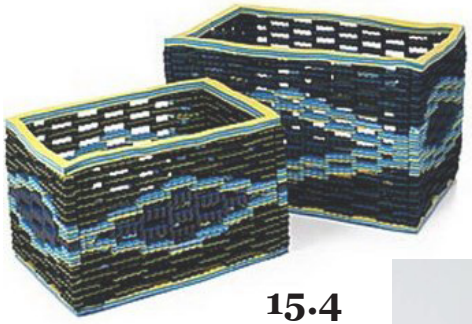
At the educational workshops and demonstration projects both children and adults will be encouraged to "make use of recycled materials to make sculptures – wire cars, African masks, waste trophies, plastic bowls, bead work, waste paper animals, tin furniture" and to "weave plastic bags into beautiful mats, hats and handbags." Through these workshops people will be "encouraged to develop artistic creativity and environmental awareness" (Gladstone & Hesse, 1998:7).

Examples of products made from recycled materials:

- A Tree sculpture out of green aluminium cans by Devon Ashley & Brooke LeFevre, 2009. See Fig. 15.1
- Seat from knitted plastic bags by Malene Lund Rasmussen, Copenhagen, 2011. See Fig. 15.2
- Green Wire Cars Exhibition by Children of Ghor al Mazara, 2012. See Fig. 15.3
- Flip-flop storage boxes handmade in the Philippines with scrap foam rubber from flip-flop factories, 2009. See Fig. 15.4
- Green Wire Cars Exhibition by Children of Ghor al Mazara, 2012. See Fig. 15.5
- Basket made from recycled materials by Miriam Gray, 2011. See Fig. 15.6
- Chair from recycled wine corks by Gabriel Wiese, 2006. See Fig. 15.7

15.1





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15.12

- Newspaper Furniture (Papa, 2009). *See* Fig. 15.8
- Bowls made from telephone wire by Earth Alley, 2008. *See* Fig. 15.9
- CD Case Chandelier by Josh Owen, 2009. *See* Fig. 15.10
- Handbags from recycled trash by ECOIST (Helen & Jonathan Marcoschamer), 2009. *See* Fig. 15.11
- Handbag from recycled trash by ECOIST (Helen & Jonathan Marcoschamer), 2009. *See* Fig. 15.12

2.2.4 Regenerative / Ecological design

Regenerative design, as defined by the Regenerative Design Group (2009) is: Design that mimics and strengthens the patterns and processes of healthy ecosystems; and design of human habitats that revitalize and support ecological health through the sustainable production of energy and material goods.

"Ecological landscape design is based on an ecological understanding of landscape which ensures a holistic, dynamic, responsive and intuitive approach" (Makhzoumi & Pungetti, 1999:209).

According to Stitt (1999:6-7), applying ecological design principles has many benefits such as reduced resource consumption, affordability, productivity and human health.

In the previous chapter, different methods were explored on how to reduce the 'mounting of waste' (mentioned in Chapter 1, section 1.2). In the following section, urban agriculture, methods on how to 'give back to nature' and how to prevent the 'dwindling of resources' will be discussed.

2.2.4.1 Urban agriculture

What is urban agriculture? According to RUAF's article, urban agriculture is described, in short, as "the growing of plants and the raising of animals within and around cities".

What makes urban agriculture different from rural agriculture is the fact that it is integrated into the urban economic and ecological system, which

means that it is "embedded in -and interacts with- the urban ecosystem" (RUAF).

Usually, typical urban resources are used like organic waste as compost and urban wastewater for irrigation. As the city grows, urban agriculture will continue to increase.

Unique examples of how agriculture can be integrated into the urban ecosystem in a prosperous way are discussed in the precedent studies chapter (Refer to Chapter 5).

Urban agriculture not only promotes community development, but also acts as learning spaces where high-quality, safe, healthy, affordable and locally-grown produce is provided for all residents of the community while supporting the urban farmers who grow them. It also gives struggling families access to the healthiest food for the lowest cost.

2.2.4.2 Giving back to nature

"Look deep into nature, then you will understand everything better." -Albert Einstein (1879-1955)

There are various ways of giving back to nature and protecting what is left, for instance by promoting ecological design through the implementation of natural processes such as the decomposition of organic waste and the cleansing of water through a wetland and bioswales.

By changing people's perception of waste we can all take responsibility for our environment and play an important role in solving this environmental problem. "Man is that uniquely conscious creature who can perceive and express. He must become the steward of his biosphere. To do this, he must design with nature" (McHarg, 1969:173).

By reconnecting and designing with nature, for example using plants in an aesthetical and functional way, will help bring nature back into the cities. "We need nature as much in the city as in the countryside" (McHarg, 1969:173).

Nature also exists in the in-between areas (the matrix) and should not be forgotten. The ecological connectivity can be increased by strengthening the qualities of nature in the matrix.

The interaction between different values of nature such as the "ecological connectivity, identity of the cultural landscape and recreational values of the landscape" can be strengthened when the social benefits of nature are increased by encouraging "social involvement with nature" (Heukels & Franssen, 2007).

Even children can play a role in giving back to nature by teaching and helping them in the educational play areas to recycle, build bird or bat houses, or bird feeders. In this way children can have fun while learning carpentry and artistic skills.

2.3 Summary

To summarize, the essence of the four theoretical concepts:

Hedonistic sustainability has the ability to enhance our quality and enjoyment of life by turning the problem of waste into something playful, a discovering process, a story unfolding and therefore experiencing the process hands-on in a fun and exciting way;

A *Didactic* approach will teach and educate people about waste and waste recycling by telling the story of waste. By telling this story, the park will be transformed into a place with meaning, where 'the reader' can go on a journey of discovery, exploration and engaging with the waste recycling process;

Applying *urban ecological* principles by investigating methods on how humans and ecological processes can coexist in a human-dominated system. Protect and enhance natural processes so city dwellers are able to enjoy and experience them. This can be accomplished by using waste as a resource through recycling organic and hard waste; and

To give back to nature through the implementation of *regenerative and ecological design* principles. Designing with nature and appreciating the beauty and value of nature and its resources. Designing sustainable human habitats through the application of urban agriculture.

By applying these theories and combining their elements successfully the following can be achieved:

- Make people aware of the waste problem, the value of waste and waste recycling;
- Change people's perception of waste;
- Use waste as a resource;
- Reduce the amount of waste filling up landfill sites; and
- Create a safe and accessible waste park with a multitude of activities