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CHAPTER

05

[program development]

urban decay as a result of neglected infrastructure

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The chapter focuses on the theoretical argument concerned firstly, with an understanding of the reason for the decay of urban fabric; secondly, with how one is to deal with such conditions; and thirdly, contextualization of a solution.

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Brown Street

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INTRODUCTION

The proposed program explored by the architecture endeavours to return meaning and value to the decaying condition of the "in-between". It suggests a shift from an environment of degeneration to one of regeneration. which by means of redefining existing infrastructure to establish a new contributive relationship with its surrounds.

The program of the regenerative infrastructure should aim to rehabilitate the city block through the unveiling and harnessing latent potential of neglected infrastructures. This potential can be expanded to provide inhabitants with a sustainable source of resources while maintaining a beneficial relationship between the urban and the natural environment.

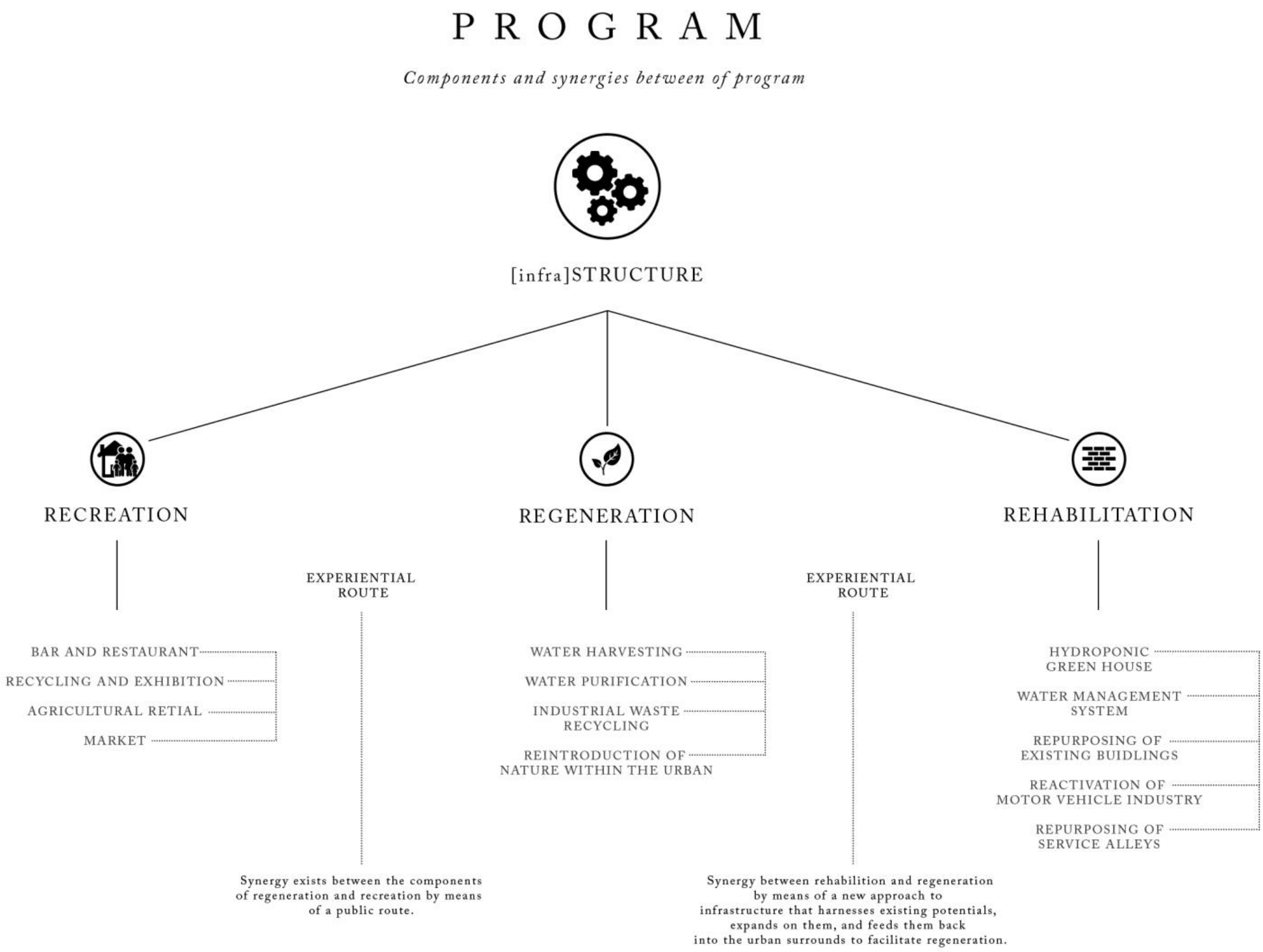

Figure 5.1 : Diagram illustrating components of the program of [infra]structure (Author, 2015).

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PROGRAMMATIC INFORMANTS

6.1 [Macro]

The block of Brown Street, located at the North Eastern edge of the Pretoria CBD, forms the defining threshold of the Soutpansberg gateway. As part of centralization, the Tshwane 2055 vision plans to establish links between the CBD and the economic nodes of Hatfield, Brooklyn, Menlyn, Irene and Centurion via formal transport systems. However, this plan of linked development has failed to recognize the North Eastern gateway, which grants access to the CBD from the North and North East.

6.1.1 [Urban Hub]

One a human level, the hub responds directly to its latent contextual potential of transportation where the various modes of transport are brought together harmoniously. Therefore serving as an urban hub where the collection and communication of people and resources manifest an energy within the core of the city block and initiate a process of transformation. The NDP (National development program) published for the city of Pretoria in 2013 encourage municipalities to invest in urban hubs. The program suggests a strategy that will enable long term restructuring of our urban settlements (NM & Associates Planners and Designers, 2013: 1).

The strategy is based on an understanding of the urban structure, which sees our cities as two distinct but independent networks (NM & Associates Planners and Designers, 2013: 1). The CBD of the city is at the centre of the primary network.

There may be a few networks within a multi-nodal urban system however, such primary network/s functions as an anchor access precinct. The secondary networks feed into the primary network. A "portal" connects the two types of network; bridging between, for example, the secondary networks in a township or a group of townships and the primary network (see Figure ##). Such portals offer access to the primary network/ node via a combination of higher order public transport links. The rail forms the backbone of these public transport networks.

It is for this reason that these points/ nodes/ portals of maximum connectivity between the primary and the secondary become the ideal places for local reinforcement and concentration of resources (NM & Associates Planners and Designers, 2013: 1). If we are to give meaning to the restructuring imperative of the NDP, focus should be drawn to more equitable patterns of access through spatial and social economic integration. Investment in these hubs will be catalytic; their market dynamics will in turn support smaller/lower income neighbouring hubs (NM & Associates Planners and Designers, 2013: 1).

These hubs will form the connection between the CBD and the broader city area. As points of

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connection, they should provide a service not only to the local residents but also those within the broadly defined area (region of district). Hubs should function as urban "service centres ". A number of important public services must here be combined with commercial activities. Essentially, this defines the role of a town centre. Historically, town centres hold symbolic value as they develop over time and so become meaningful to the people who use them. It should therefore be the intention of urban hubs to attain cultural significance (African Identity). Residential components are another feature of town centres. Commercial land use and transport services are heavily reliant on residential developments. Residents also provide essential levels of vibrancy and increased levels of passive security. Without residential integration and the resultant 24-7 occupancy and accessibility, it is likely that these hubs will not succeed. In conclusion, an urban hub should be a service point (key housing/ working destination for local residents); a potential draw-card into the area for outside residents; and a gateway to the broader urban area for local residents. The urban hub has the potential to address a number of needs simultaneously. These include social problems, such as, unemployment, crime, degraded environments, lack of key bulk infrastructure, base local and metro wide connectivity; but also broad concerns of a low private sector confidence level and social economic integration. If these new hubs are to succeed as vibrant, mixed-use environments they must create a sense of place; cater for those on foot; be structured around a safe, convenient, secure and comfortable public space network; and be supported by a mix of land uses and activities.

6.1.2 [Recycling]

Inhabitants of the in-between have turned the condition of decay and disadvantage to an advantage; recycling manageable quantities of industrial scrap metal in the creative production of sculpture. This gives rise to the opportunity of including educational and cultural recycling as a component of the regenerative system (Littman, 2009: 3). The Community Green Station (see precedent 4.3) is an ideal example of how recycling efforts can assist regenerative transformation within a dilapidated area. Accommodating these recycling processes in the proposed [infra]structure will help to reduce waste on site and, in turn, clear the much needed "in-between" spaces of the city block. The design of the building intends to transform these spaces into public routes that improve pedestrian mobility. Therefore, the "people of crisis" or "the inhabitants of the in-between" (Woods, 1997: 13); the informal artisans; and the individuals responsible for the informal recycling efforts are the artists/ artisans responsible for the recycling component of the [infra]structure. These artisans also play another crucial role in added security through surveillance.

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WATER AS ENABLER

[water harvesting]

Water is an essential feature which contributes to the liveability of a city. It is not only necessary to sustain human life but is also to life source of the natural world. Based on the assumption that by the year 2025 there will be a shortage of water, arrangements must be made to assure provision of potable water that is not only sustainable but also regenerative.

The following section describes how contextually driven programs have been formulated to address the potential water crisis, while simultaneously addressing urban decay in a regenerative manner. The inclusion of water in the intervention is important to the immediate site and forms the driver of the project's urban component. It assures the site inclusion in the Tshwane 2055 urban vision.

[the design of living technologies for waste water treatment]

by John Todd

The emerging field of ecological design can address a broad range of issues. It will influence the future of waste water treatment, environmental restoration and remediation, food production, fuel generation, architecture and the design of human settlements. Ecology is the foundation for the development of new technology capable of supporting society (Todd, 1996: 109). Ecological engineering is merely three decades old and attempts to codify design principles thereof must thus be tentative. As a discipline, it is only in the past few years that ecological engineering has been formalized.

The terms ecological technology, living technology and living machine are used interchangeably. Mitsch (1993) states that "ecological engineers participate in ecosystem design providing choices of initial species as well as the starting conditions; nature does the rest". This view represents a fundamental shift in thinking about the relationship of humans with other forms of life in a technological setting (Todd, 1996: 110). Such engineering allows for the same to be said for ecology within the realm of the built environment.

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[infra]structure : water

Infrastructure should form part of the process, mediating between the questions and their architectural responses. As architects reclaim their original tools, they should relate architecture to material practices, such as, ecology and engineering; practices that are concerned with the conception and transformation of large scale assemblages over time (Delalex, 2006: 54). Based on the idea that infrastructure is to become architecture, it is then essential to understand the process of water treatment. It is crucial to grasp how this process facilitates the creation of space.

[the Living Machine]

The Living Machine is an emerging wastewater treatment technology. It utilizes a series of tanks that support vegetation and a variety of other organisms. Engineered by Dr. John Todd, the machine gets its name from the way in which the ecologically-based components are integrated in the treatment process. The Living Machine incorporates many of the basic principles used in conventional biological treatment systems; including sedimentation, filtration, clarification, absorption, nitrification and de-nitrification, volatilization, as well as anaerobic and aerobic decomposition. Primarily, it is the use of plants and animals in the treatment process that sets the system apart from conventional water treatment. It should be noted, however, that while the system is aesthetically appealing, the extent to which the animals and plants contribute to the treatment process in the current design of the Living Machine is still being verified. The Living Machine, Inc. describes a wastewater treatment system that it is capable of achieving tertiary treatment; costs less to operate than conventional systems when used to achieve a tertiary level of treatment; and does not physically require chemicals that are harmful to the environment as part of its treatment process (Living Machines, Inc., 2001).

"Several federally-funded Living Machine® demonstration systems have been constructed, the largest of which handled design flows of up to 80,000 gpd. As configured for these demonstrations, these systems treated municipal wastewaters at various strengths, and reliably produced effluents with five-day biochemical oxygen demand (BOD5), total suspended solids (TSS), and Total Nitrogen < 10 mg/L, Nitrate < 5 mg/L, and Ammonia < 1 mg/L (U.S. EPA, 2001 and see Table 1). With regard to phosphorus removal, the Living Machine® process is capable of about 50 percent removal with influents within the 5-11 mg/L range" (U.S. EPA, 2001). THE COMPONENTS OF THE LIVING MACHINE®: (1) ANAEROBIC REACTOR, (2) ANOXIC REACTOR, (3) CLOSED AEROBIC REACTOR, (4) OPEN AEROBIC REACTORS, AND (5) CLARIFIER.

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Step 1

[Anaerobic Reactor }

When activated, the anaerobic reactor serves as the initial step of the water treatment process. The reactor has a similar function to that of a septic tank and is usually covered or buried below ground level. The main intention of this initial step is to reduce the concentration of BOD_5 and solids in the waste water prior to its treatment by the ensuing components. When necessary, gases are passed through an activated carbon filter to control odour (U.S. EPA, 2001: 2).

Step 2

[Anoxic Reactor]

The anoxic reactor is mixed and has controlled aeration to prevent anaerobic conditions. The main purpose of this component is to promote growth of floc-forming micro-organisms, which will remove a significant portion of remaining BOD_5. Mixing is accomplished through aeration by a coarse bubble diffuser. Additionally, an attached growth medium can be placed in the compartment to facilitate the growth of bacteria and microorganisms (U.S. EPA, 2001: 2).

Step 3

[Closed Aerobic Reactor]

The purpose of the closed aerobic reactor is to reduce wastewater BOD_5 to a low level, to remove further odorous gases and to stimulate nitrification. In order to remove odorous gases the tank is coupled with a bio-filter. The bio-filter is typically situated over the reactor and is planted with vegetation to control moisture levels in the filter material. (U.S. EPA, 2001: 2).

Step 4

[Open Aerobic Reactors]

Next in the process is the series of aerobic reactors. These are similar to the close anaerobic reactors in both design and mechanics; however, instead of being covered with a bio-filter, the surfaces of these reactors are covered with vegetation supported by racks. These plants provide the surface area of the wastewater with microbial growth, perform nutrient uptake and can serve as a habitat for beneficial insects and micro-organisms. The aerobic reactors are designed to once again reduce the levels of BOD_5 and also to complete the process of nitrification. The size and number of these tanks are dependent on the influent characteristics, effluent requirements, flow conditions, and the design's water and air temperatures (U.S. EPA, 2001: 2).

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Step 5

[Clarification]

A clarifier is used as this component in the system. The tank allows for the remaining solids to be separated from the treated wastewater. The settled solids are pumped into the closed aerobic reactor (step 5), or transferred to a holding tank and then removed for disposal. The surface of the clarifier is often covered with duckweed, which prevents the growth of algae in the reactor (U.S. EPA, 2001: 2).

[Applicability of the Living Machine]

The Living Machine is designed to be capable of treating both municipal and some industrial wastewaters. However, due to the fact that the treatment process requires plants, it can take up more space than conventional systems. A positive to be considered is the educational benefits of the Living Machine; to create awareness of the advantages of water treatment and how such treatment processes contain regenerative possibilities.

Figure 5.2 : Diagram illustrating the Living Machine as incorporated into small scale system (Author, 2015).

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Figure 5.3 : Photographs of an original Living Machine system components (reference, 2015).

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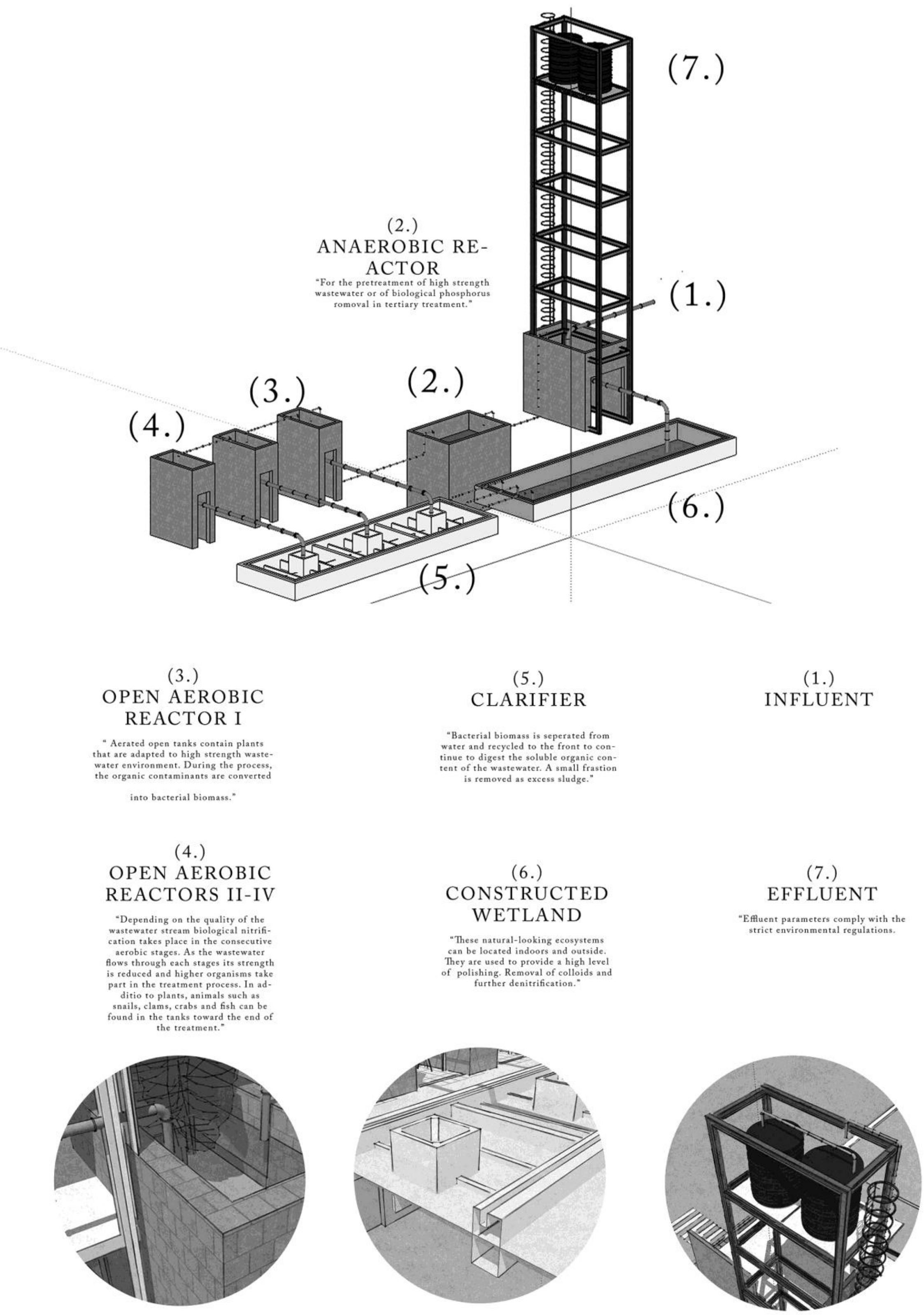

Figure 5.4 : Diagram illustrating components of the Living Machine as incorporated into a baseline iteration (Author, 2015).

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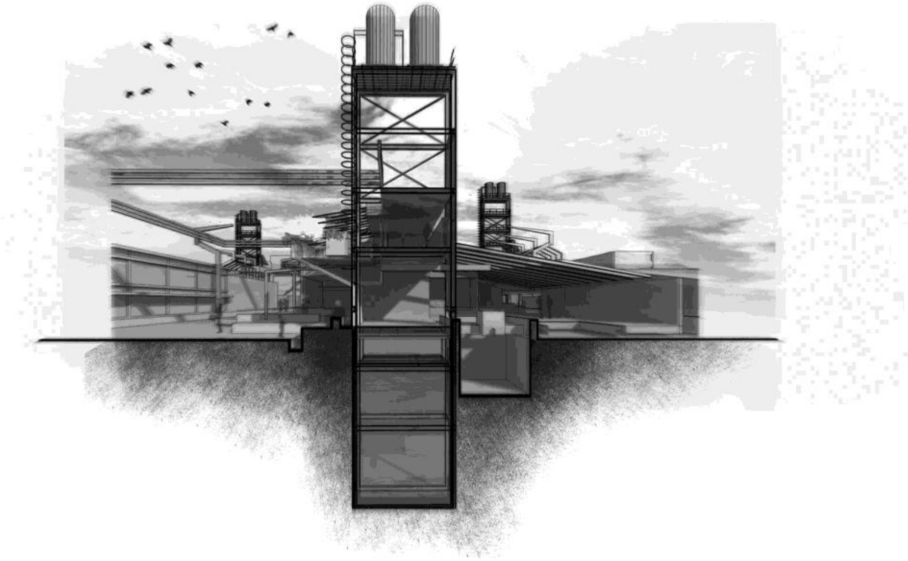

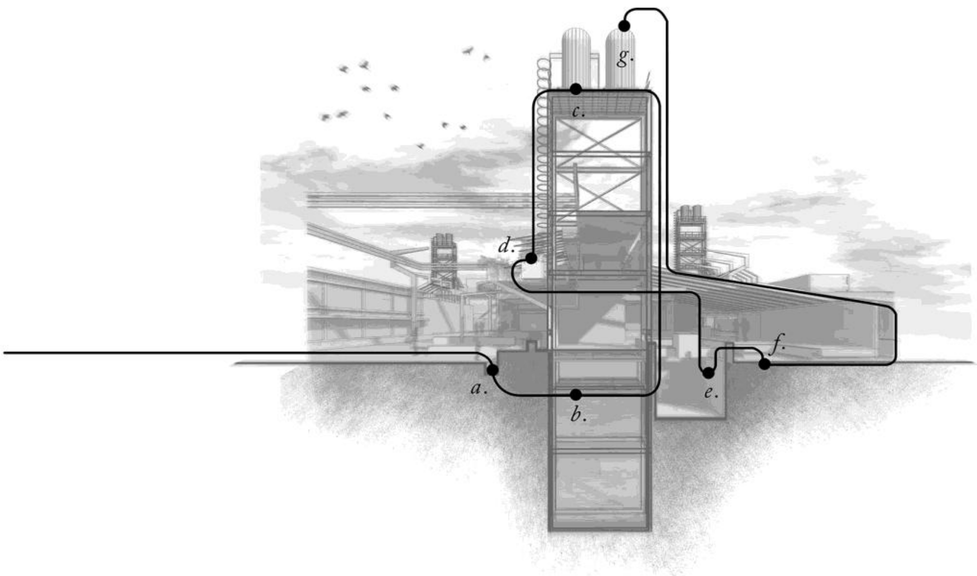

a. grit trap *b. large reservior* *c. steady head tank* *d. reed bed scubber tanks* *e. clarifier* *f. final reed bed* *g. effluent*

INFRASTRUCTURE

Water Purification System
Scale 1:200

Figure 5.5 : Diagram illustrating components of the Living Machine as incorporated into an early design iteration (Author, 2015).

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