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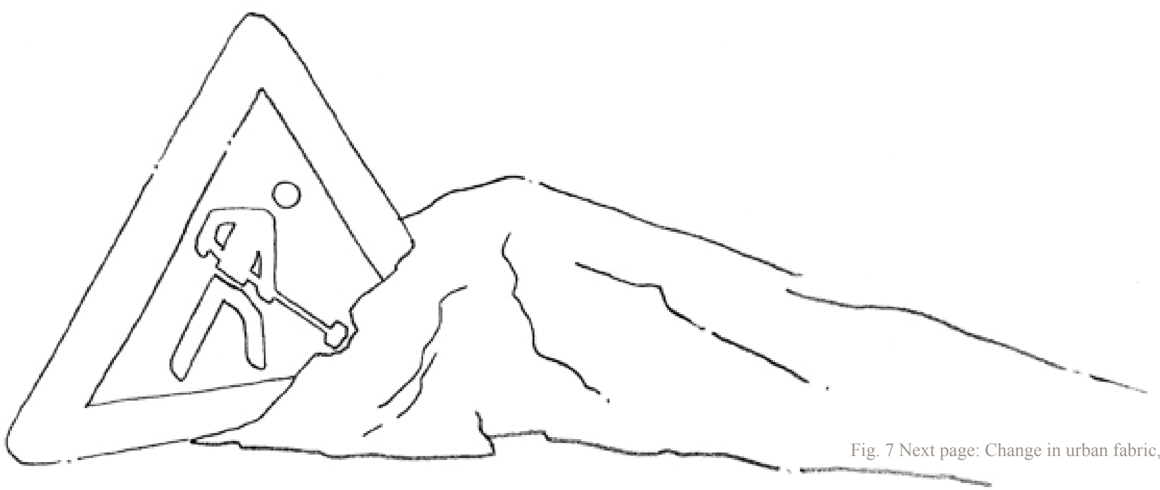
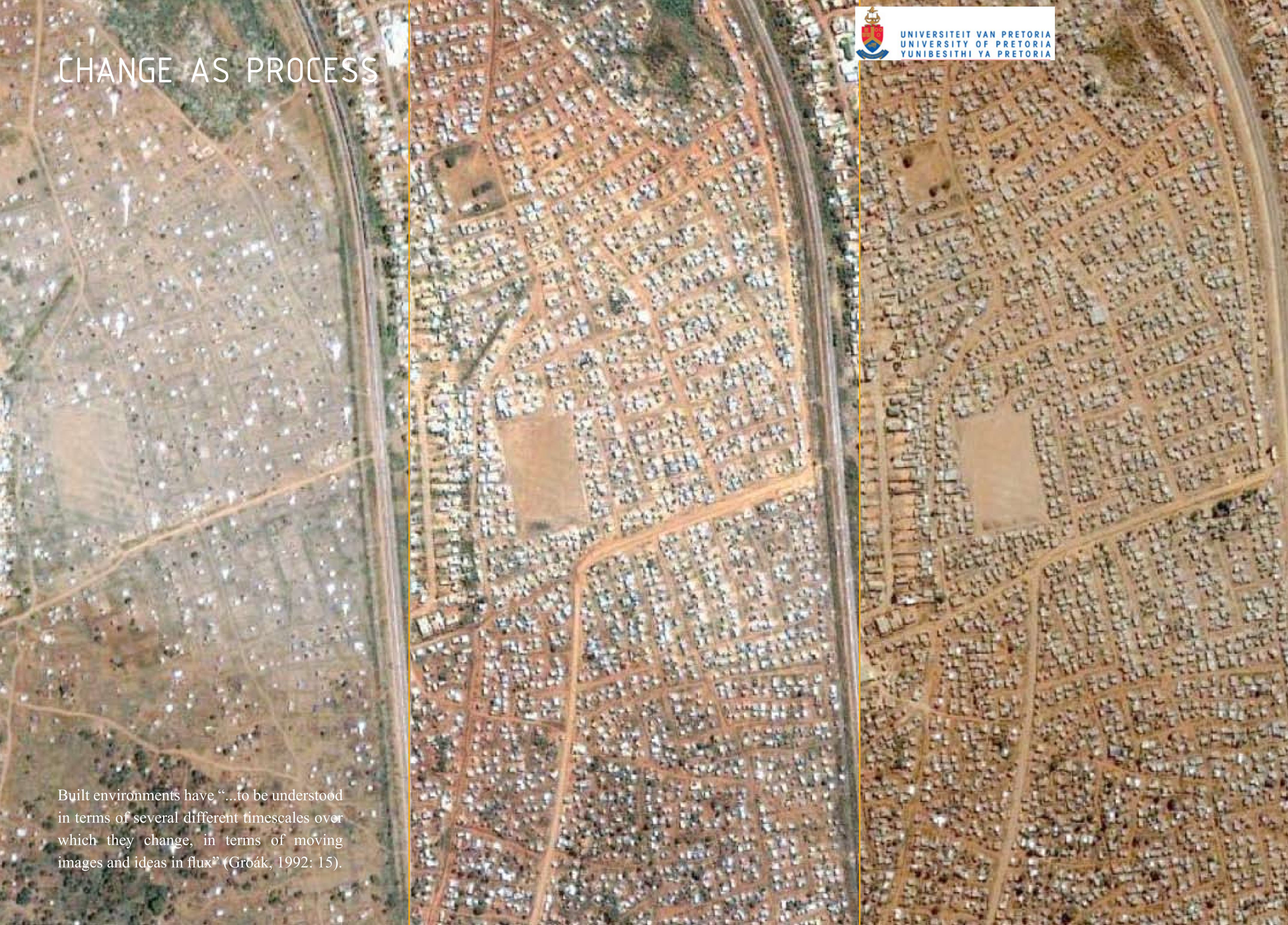


Fig. 6 Work in progress

Fig. 7 Next page: Change in urban fabric, Phumolong, Mamelodi

CHANGE AS PROCESS



Built environments have "...to be understood in terms of several different timescales over which they change, in terms of moving images and ideas in flux" (Groák, 1992: 15).

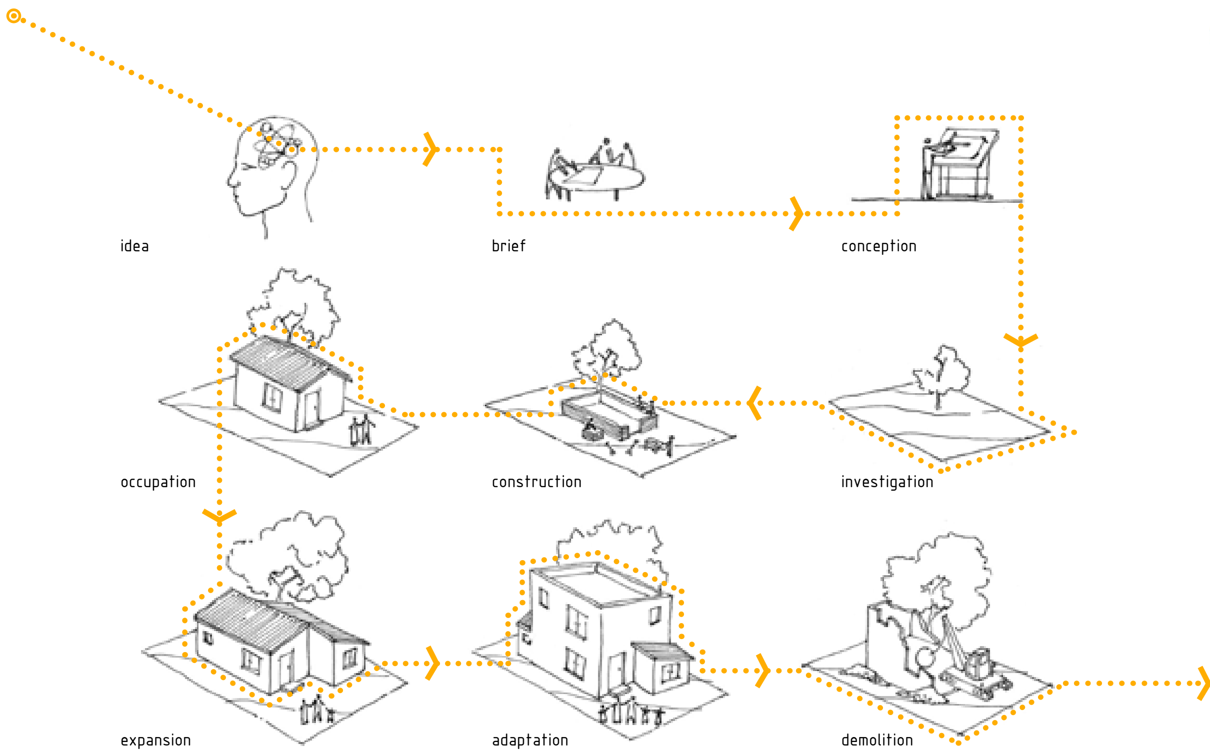


Fig. 8 Parts of the architectural process

Two adjacent buildings built about 1850

The somewhat altered two buildings in 1993

Fig. 9 The front cover of *How Buildings Learn*, by author Stewart Brand, epitomises the unavoidable nature of a buildings' need to change, whilst the original blueprints impose guidelines for future intervention.

PROBLEM STATEMENT

Architectural design and its realisation is often considered as final. Despite this expectation, very few buildings remain true to their original design purpose.

ARCHITECTURE AS PROCESS

Architecture is a process, from the initial design conception on paper to its realisation through construction and functional operation. Among others it exists as physical manifestation – space and place, however the passage of experience. Architecture is not merely a product representing the conclusion, but subsists through time by an ongoing process of learning and reacting to its ever changing input variables. Ultimately it is a process of cognition.

CHANGE

Change within the built environment and buildings are inevitable. This aspect should be embraced by designing for it from conception, through evolutionary existence and even past its destruction. Architecture is as result of an environments' continued capability of responding.

In the publication *The Idea of Building*, author Stephan Groák describes "the fundamental flows of energy and matter which impinge upon buildings, and their occupants, and the consequences of these flows in terms of buildings as complex systems of reservoirs" (Groák, 1992: 7). A building (or any entity for that matter) envisaged as a complete whole undermines the critical performance of its constituent parts. A building cannot be a static whole as it exists in an environment of flux. Its parts respond continuously and dynamically to the vast array of forces inflicted upon the system in order to allow the whole to survive in a constant state of quasi-static equilibrium. These 'built' reservoirs experience turbulence throughout their lifetime. A well designed reservoir should be capable of accommodating such change in flows of energy. A building system is a responsive environment reacting to a change by force, man-made and natural, emanating from the intense advancement in technology and services, forces derived from diverse cultures, social change, real-estate value, climatic conditions and usage. Groák further argues that "buildings have to be understood in terms of several different timescales over which they change, in terms of moving images and ideas in flux" (Groák, 1992: 15).

Most design choices are made within an isolated environment allowing limited understanding of future conditions. Change is unpredictable. No design can accurately predict future conditions, but it should consider time and its changing requirements. A good design should be accommodating of chaotic future actions without losing functional efficiency. In the publication entitled *How Buildings Learn*, Brand argues that time is needed to correct mistakes (Brand, 1995: 64). However, in contrast to the static nature of the built environment, "new usages persistently retire or reshape buildings" (Brand, 1995: 2). Brand further argues that "when we deal with buildings we deal with decisions taken long ago for remote reasons" (Brand, 1995: 2).

AN ALTERNATIVE OPTION

A built system capable of learning and evolving in time, integrating change within the system could be described as an alternative to the above. According to Brand it is necessary to design for future scenarios by "devising an 'adaptive' strategy that is exceptionally alert to changing events and can adjust quickly" (Brand, 1995: 183). Therefore any built system should be adaptable and flexible throughout its life span, acting as a response to ever-changing conditions and paradigm shifts. Groák refers to the capability of different social uses, whilst flexibility encompasses different physical changes (Groák, 1992: 15).

1863 - The original Cliff House restaurant, San Fransico, USA

1878 - Gambling casino

1900 - Private amusement palace, restaurant and ballroom

1910 - Restaurant

1946 - Restaurant & worlds largest curio shop

1954 - Restaurant

1973 - Restaurant

1991 - Restaurant

The illustrations above depict a programme that remained largely unaltered. However, time necessitated various changes to the built form.

Fig. 10 Change over time

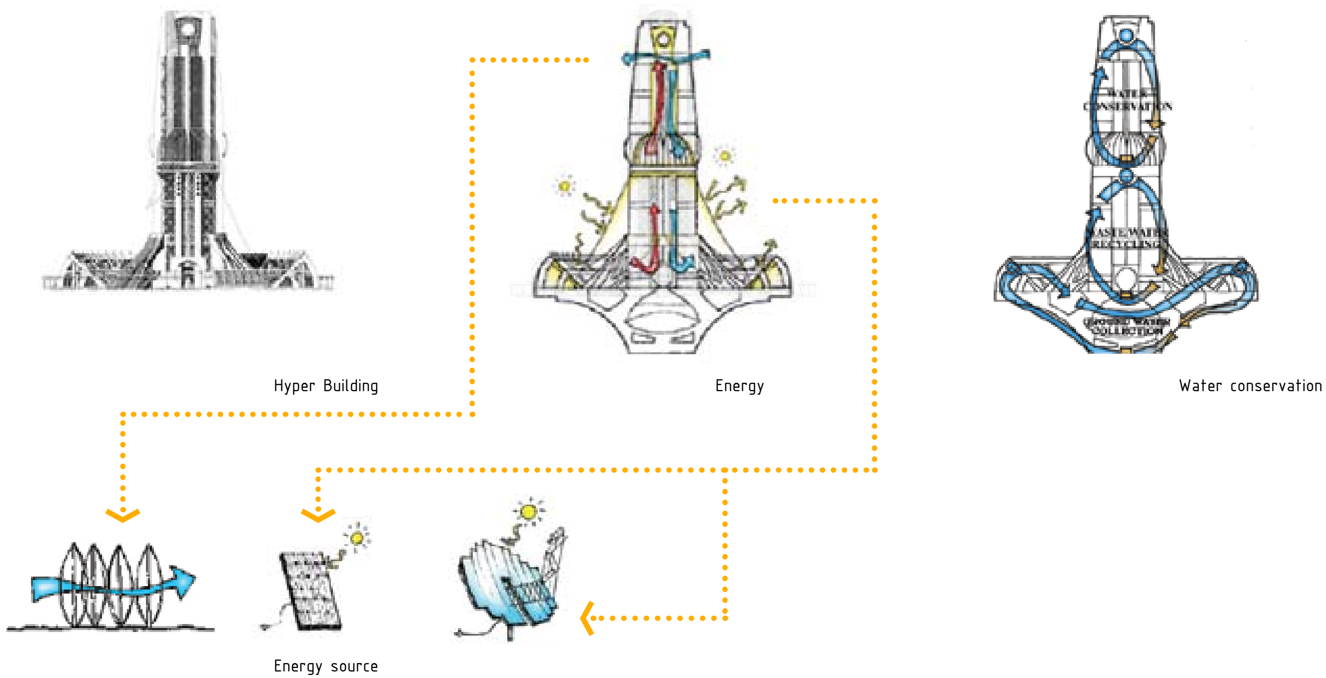


Fig. 11 The Hyper Building, accommodating residential, commercial and agricultural activities is a conceptual Arcology by Paolo Soleri

ENERGY, SYNERGY AND AUTONOMITY

Architects have a duty to formulate sustainable designs for the future because the built environment has wide ranging effects over an extended period of time.

The theory of Arcology, established by architect Paolo Soleri, aims to “embody the fusion of architecture and ecology” promoting a more “frugal, efficient and intelligent city design” (Arconsanti, [sa]: 2) this is achieved through a symbiotic relationship between parts and whole. It encourages a healthy system through the interaction of the parts. Ultimately, Arcology seeks to create an autonomous (self-sufficient) system operating on the scale of buildings, or on the larger macro scale of cities. These systems act in an intelligent manner, responding to direct and indirect forces of the built environment. In addition, these systems seek to produce their own energy and operate off-grid, remaining largely independent of off-site supplied services. The approach finds validity where development takes place within an informal settlement, because of limited infrastructure and services. However, a synergistic infrastructure is essential to operate an autonomous system. Soleri’s Third Generation Arcology incorporates “modular and possibly standardised structures (which) would be

Fig. 12 The Earthship, built mainly from recycled materials, the sustainability centre uses renewable energy and water recycling strategies to increase its self-efficiency.

Fig. 13 A pavilion based on the arcology theory, Hanover Expo, 2000.

articulated in a variety of arrangements… to fit specific conditions…” (Arconsanti, [sa]: 2). Resource efficiency is coherent throughout the theory of Arcology. Energy extraction and circulation in the built configuration is integral to maintain a continued existence. Expanding on Soleri’s hypothesis, architecture should consider future adaptations of the building. Although an autonomous system might prove difficult, appropriate technology could increase its level of independence.

DISSIPATIVE SYSTEMS

Architecture may be perceived to behave as a dissipative system, complex by nature, subsisting through a perpetual exchange of energy across its dynamic boundaries. Architecture is reserved as an evolving stage for the user, but it is situated within a larger ecosystem.

Dissipative systems (or dissipative structures) “not only maintain themselves in a stable state far from equilibrium, but may even evolve. When the flow of energy and matter through them increases, they may go through new instabilities and transform themselves into new structures of increased complexity” (Encyclopedia of Human Thermodynamics, 2009: 3). Most organic forms depend upon a chaotic system responsible for its dynamic stability. Dissipative systems include convection, cyclones and hurricanes. To this list can be added informal settlements. The environments of these settlements exist in a quasi-state of equilibrium. In addition, their existence is provisional and depends largely on the carrying capacity of the land and external forces. This dissipative system exists as a complex configured arrangement of multiple systems in impermanent synergy. A cyclone, is an example of a dissipative system, makes use of a constant uninterrupted flow of absorbed energy to sustain its form. The cyclone will eventually cease upon the disruption of the system. Informal settlements experience a continuous, yet fluctuating exchange of matter and flow of energy. This is comprised of users, passer-bys, electricity and water among others. The discontinuation of one of these forces will influence the system and its ability to function.

CONCLUSION

The above theories and systems represent idealistic extremes that should be balanced within the pragmatic requirements of the existing. In addition, the reality of the situation, with emphasis on site and environment should be considered as the primary design force.

Fig. 14 Government subsidised house requiring owner to fund any new additions, Mamelodi, 2008.

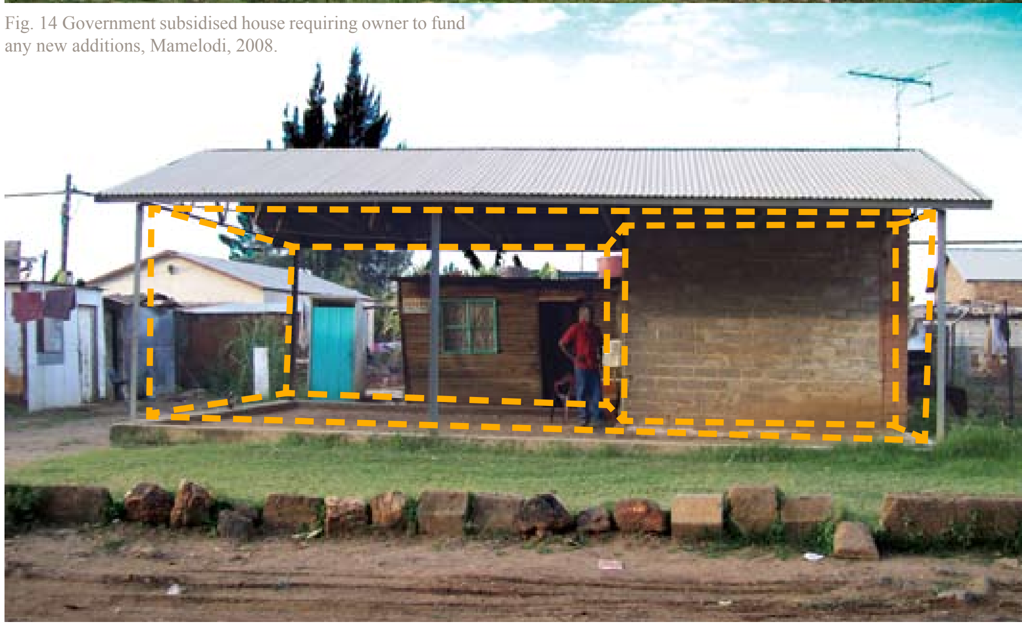


Fig. 15 Additions and alterations expected and encouraged