

Design Strategies for the Densification of Low Income Housing

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Abstract

The problems of excessively low residential densities are of increasing concern to South African policy makers. This paper describes a new model that could be utilised to increase residential densities. This alternative is inspired by local informal housing processes.

The paper analyses both spatial and non-spatial problems associated with the government's housing subsidy programme. It then explores how housing beneficiaries have creatively addressed some of these issues by transforming their subsidised houses, primarily through the addition of back yard rooms. The paper then describes a new housing typology which uses backyard rooms as a valuable precedent.

The illustrated paper examines design issues that arise when designing at an optimal 100 units/ha such as:

- Strategic placing of the initial unit;
- Accommodating additions to the initial unit;
- Utilising the site effectively to ensure adequate outdoor space;
- Enabling occupation by a number of households;
- Accommodating home-businesses;
- Contributing to streetscape; and
- Balancing public and private space.

1 Introduction

Since 1994 approximately 1.5 million subsidized houses have been built in South Africa at a cost of about R24 billion. In the past, most of these houses were delivered by the South African Government through project-linked subsidies and became known as "RDP houses". Later, this mode of delivery was shifted towards the "People's Housing process" (PHP), where beneficiaries were encouraged to participate in delivery. In the last three years, beneficiaries have been obliged to contribute a sum of R2479, and houses have become known as "2479s".

These housing delivery mechanisms have promoted the familiar one-house per plot housing typology - often on the urban periphery - reinforcing the sprawling, fragmented, racially divided character of South African cities. Preliminary data from an HSRC study has indicated that in the period between 1994/5 and 2001/2 the spatial spread of South African cities has grown from 125 million hectares to 170 million hectares, an alarming 38% increase in the take up of land in the six years. This is not surprising given the very low densities generated by this type of development.

Urban theorists in South Africa have identified low-density development as one of the critical factors inhibiting the creation of sustainable settlements: Low-density settlements are problematic in that they generate:

- Inadequate population thresholds which are unable to support viable public transport, shops or social facilities;
- Vast distances between neighbourhoods forcing residents to rely on motorised transport which in turn contributes to unsustainable use of fossil fuels and results in high levels of air pollution;
- Inconvenience for residents who have to spend large amounts of time commuting from one part of the city to another;
- High costs for municipalities who are obliged to deliver services to far-flung areas; and
- Infrastructural inefficiencies that arise when relatively few people utilise available resources.

The problems associated with urban sprawl are compounded by the separation of land uses - or mono-functional zoning. This forces people living in areas that are exclusively residential to commute to other areas to shop, or work, or attend schools, clinics etc. [1].

2 Freestanding Houses

Low density development is only one of the physical challenges associated with this form of housing delivery. Other physical challenges relate to the poor quality of the neighbourhoods - the result of monotonous layouts and undefined street space. Also, little design attention is given to how the housing unit could be extended, even though this form of subsidized housing was meant to function as a starter unit, anticipating incremental growth over time. Further problems relate to the inadequate nature of the individual housing units themselves. Beneficiaries have consistently articulated their dissatisfaction with the houses they have received. They complain about poor quality finishes and an inadequate amount of space [2]. In addition, few residents have been able to reap the asset value of their properties.

Other non-spatial criticisms have been directed at this housing delivery programme. The prioritisation of home-ownership as an ideal, to the exclusion of other forms of tenure has inhibited choice in the housing market and has excluded large numbers of citizens in search of rental options. Increasing concerns have also been raised about the affordability of this 'suburban dream'. Beneficiaries of subsidised houses often sell their houses because the ongoing operating costs of such houses are unaffordable. Furthermore these housing typologies have been designed to accommodate nuclear families, ignoring a wide diversity of other household arrangements. This delivery mechanism has also focussed exclusively on the concept of housing as shelter – neglecting the income producing aspects of housing

The following analysis looks closely at the physical nature of freestanding houses that have been delivered through the national Department of Housing Subsidy Scheme. Houses measuring 30m² on

plots of 250m² accessed by generous amounts of road-space have generated low densities of 40 units per hectare, or 160 persons/ hectare.

2.1 Disadvantages of this type of development

- The architectural quality of these settlements is poor;
- Location of the house in the middle of the plot fragments the outdoor space and limits opportunities for expansion;
- Standardised house plans give rise to dismal and monotonous environments;
- Without money to erect fencing or build boundary walls, residents have no way of defining their private outdoor space. As a result, passive surveillance is impossible, and security becomes a problem;
- Low residential densities generate inadequate thresholds for delivery of urban services such as electricity, water, public transport, roads and social amenities;
- Low residential densities make residents dependent on motorized transport. This results in long and costly commutes, unsustainable use of fossil fuels and high levels of air pollution; and
- Because development of this nature requires large amounts of land, settlements are inevitably located on the periphery, where large vacant tracts can be found.

2.2 Advantages of this type of development

- Provides relatively generous amounts of private outdoor space and a sense of spaciousness;
- Contrasts positively with the overcrowded environments in which many beneficiaries were formerly accommodated such as shack settlements and hostels;
- Facilitates easy development in projects based on mass production;
- Allows for the clear demarcation of legal boundaries;
- Has some potential for additions over time;
- Has some potential for flexibility of use where one or more room can be used as a workshop, spaza etc. and
- Has some potential to accommodate a diversity of household arrangements – nuclear families, extended families, tenants etc.

Significantly, government has demonstrated that it has been highly effective in rolling RDP, PHP and 2479s. Its success in this sphere should therefore be harnessed and should inform future policy interventions.

3 Beneficiary Response

Housing beneficiaries, who have been at the receiving end of these programmes, have not remained passive in the face of these challenges. Confronted with poor quality housing unsuited to their needs, they have devised a number of innovate strategies to improve their housing conditions. Some residents have focused on improving finishes. Others have elected to build on additional rooms, so that their houses can better accommodate their particular household arrangements. Other home-owners have chosen to turn their homes into income producing assets, transforming rooms into spaza shops, hairdressing salons and other types of home-businesses. But in other instances, beneficiaries have resorted to that well established South African urban tradition – the erection of backyard rooms for rental purposes.

The addition of backyard rooms has been viewed in a negative light by the authorities – largely because the increased occupancy densities have placed unanticipated strain on existing infrastructural services. However, there are a number of positive aspects associated with back-yard rooms. From the tenant's perspective, it is often the only rental accommodation that he/she can afford; it takes cognisance of ongoing migrancy where people come to cities to work, but maintain links with families elsewhere and the rooms are capable of accommodating extended families. Furthermore, from a landlord's perspective, the addition of backyard rooms contributes to the landlord's revenue stream and enhances the landlord's house as an asset.

This pattern is growing. "During the 1990s more new tenancies were created in the informal than in the formal rental sector". By 2001, the census counted 460 000 households, about 2.3 million people, living in backyard shacks and 530 000 households, about 2.7 million people, living in formal backyard structures or in rented/shared rooms within houses [3].

The following analysis looks closely at how densities can be increased and how housing environments can be transformed in subsidised housing settlements through the addition of backyard rooms.

3.1 Advantages of backyard rooms

Backyard rooms:

- are usually in good locations close to work opportunities and social amenities, often on land already set aside for residential use;
- provide affordable accommodation with access to basic services;
- often accommodate extended families and support kinship networks;
- can be developed incrementally as the primary homeowner acquires more capital;
- harness the entrepreneurial talents of the community;
- disperse political risk because there are a large number of small landlords;
- increase densities;
- make more effective use of existing infrastructure;
- allow small contractors to engage in construction;
- provide rental accommodation for residents who do not wish to pay more than about R100-R200 a month because this is all they can afford. Alternatively this is all they wish to pay, as they do not see themselves primarily as urban residents;
- provide rent to landlords and supplement the revenue stream of the primary homeowner; and
- help to define outdoor living space, often serving as the major social gathering area in township environments.

This is the current delivery mechanism for most of the existing rental stock in old townships. As a result both landlords and tenants are familiar with the system and landlords have developed the capacity to manage this form of rental albeit in an unregulated fashion. There is also evidence that when the landlord lives on the premises or close by, there is less conflict.

3.2 Disadvantages of backyard rooms

- Densities are often excessive.
- Rooms often do not have adequate light and/or ventilation and are often built using flammable materials.
- Infrastructure provided on the basis of one residence per plot cannot always cope with the increased densities.

- Landlord/ tenant relations are often unregulated.

The positives undoubtedly outweigh the negatives. This suggests that the backyard could provide valuable lessons for the development of a new housing typology.

4 Towards a New Housing Typology

Inspired by this home-grown housing solution, this paper argues for a new form of housing delivery. On the one hand, this new typology builds on the considerable experience of the South African government in rolling out 'mass housing'. On the other hand the model sets out to significantly increase the housing densities ordinarily associated with subsidised housing.

The following section explores an appropriate density for this new housing model.

Barry Senior in his unpublished PhD, entitled "Factors affecting residential density: A search for the Zen of Density" [4], identifies three measures of density:

- Building density measures the number of units per hectare;
- Occupancy density measures the number of people per unit; and
- Population density is a combination of these two and measures the number of people per hectare.

Senior points out that there is no direct relationship between affordability and density. There are high-quality, high-density environments (such as flats designed for an affluent clientele) as well as low quality high-density environments (such as hostels where large numbers of people are crowded into a small space). Senior graphically illustrates the point by comparing Majestic Mansions in Hillbrow Johannesburg, an up-market apartment complex built in the 1970s, with Meadowlands hostel in Soweto. Both schemes have the same occupancy density of 700 people per hectare. Their respective building densities differ radically however. People in Majestic Mansions occupy large spaces, stacked on one another in a high-rise development. In Meadowlands hostel, the same number of people occupy small spaces in a single story development.

This suggests that each density measure will have its own set of opportunities and challenges, and that a compromise will have to be sought out between the conflicting demands of urban residents, looking to optimize private space and municipal authorities, keen to reduce infrastructure costs. It is however possible to identify an optimal density range where such compromises balance one another out. This paper advocates housing densities ranging from 150 to 450 people per hectare.

Senior then tabulates the housing forms associated densities ranging between 150-450 people per hectare:

- Semi-detached/attached single/double story housing built up to the boundary line;
- row houses; and
- Three- to four storey walk-ups, up to six storey flats.

It is notable that very few of these housing forms are currently being delivered by government housing programmes, with the exception of flats, delivered through the government's Social Housing Programme.

5 Design Issues

While increasing density will help to reduce the take-up of land and will help to make infrastructure more efficient, improved densities do not automatically make environments more liveable or housing developments more sustainable. As housing densities increase, good design becomes critical impacting on decisions about where to locate the starter unit, how to balance built and open space, how to address issues of privacy and overlooking, how to provide access, and how to ensure that the housing unit contributes to the street space.

This paper suggests a new housing typology – low-rise high density - designed with a view to facilitating incremental additions over time, creating defined street spaces, accommodating a variety of uses (including home businesses and household rental) and maximising the amount of outdoor space on very small sites. This is achieved by constructing the starter unit hard up against the front boundary and along one side boundary. This has a number of advantages:

- it creates a streetscape at the earliest stages of the development
- it maximises the outdoor space at the back of the stand
- it provides enough side-space for on-site parking
- by using the building to define the boundary of the stand privacy and security is enhanced.

Also, by ensuring the frontage to depth ratio of the stand is a minimum of 1:2, the amount of space given over to roads is minimised, and the length of piping for infrastructure and services is reduced. This represents a considerable saving for the municipality.

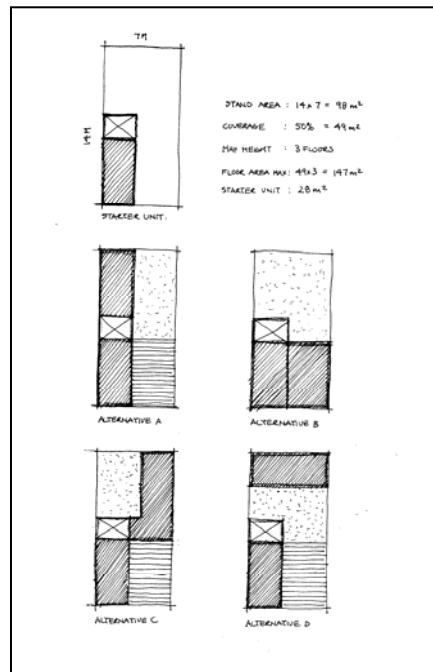


Figure 1: Proposed 100sq.m stand with a 28m² double story starter unit and alternative possibilities for expansion

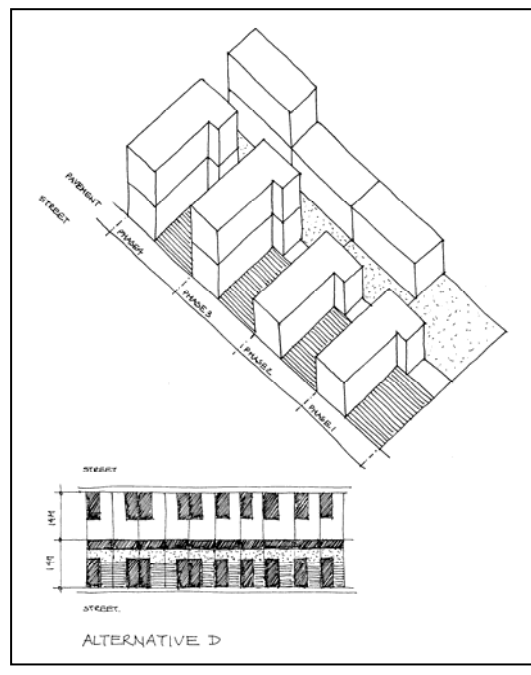
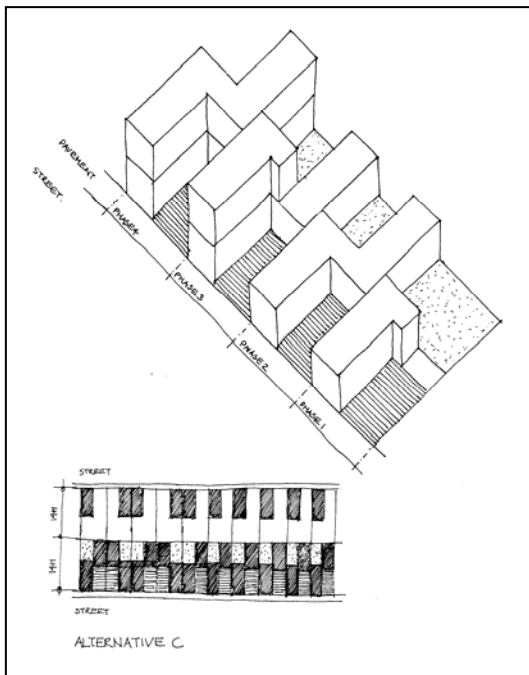
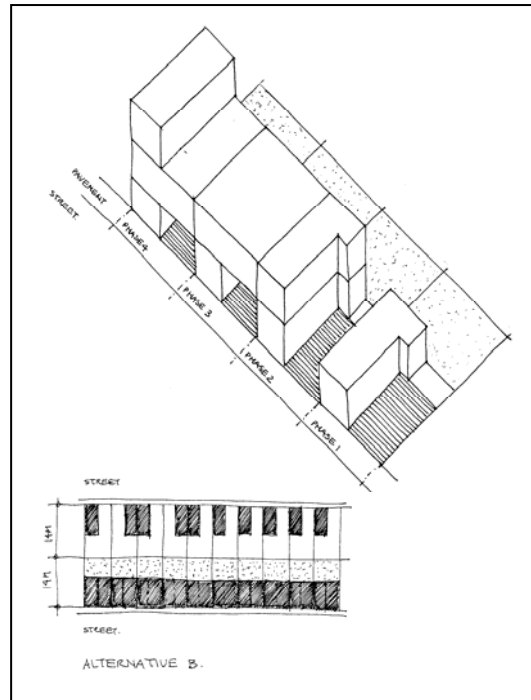
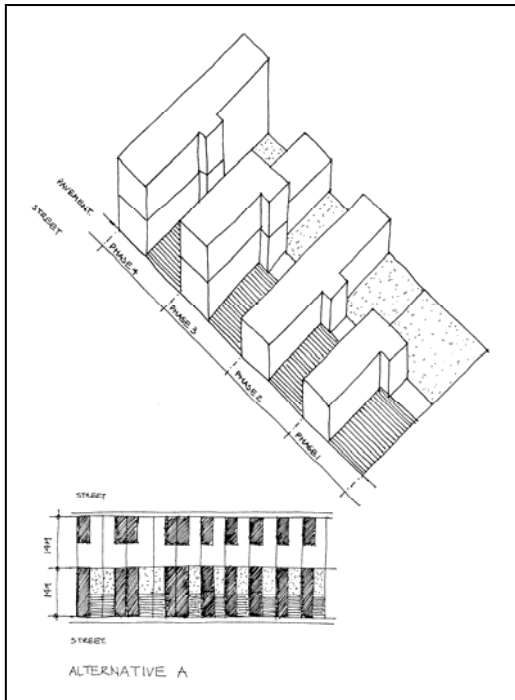


Figure 2: Alternatives possibilities for expansion over time

Fig. 2 illustrates that there are a number of ways of expanding the starter unit over time. This will ensure variety and diversity within the housing environment as people personalise their own homes according to their unique household arrangements or on the basis of various income generating opportunities.

6 Comparative Analysis

The following section compares the current housing delivery with the proposed new medium-density housing model. For the purposes of illustration, the authors compare a standard 250m² with one half its size at 112,5m² stand. The top three stands in Fig 3 show how the conventional 250m² stand develops over time through extensions to the original house and by the addition of backyard rooms. The bottom five stands in Fig. 3 illustrate how the proposed 112.5m² stand could develop over time, on the basis of similar additions.

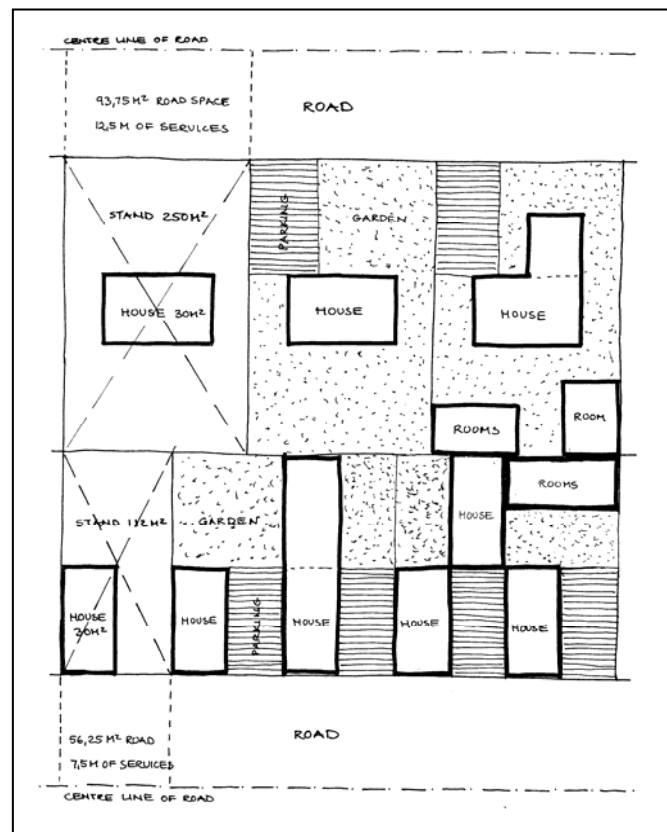


Figure 3: Comparative analysis

A conventional 250m² stand with a 30m² starter unit generates: 93.75m² of road space; 12.5m length of services; 75m of perimeter fencing. Over time, extensions to the house and the addition of backyard rooms will tend to fragment the outdoor space. By comparison, a 112.5m² stand with a 30m² double story starter unit generates: 56.25m² of road space; 7.5m length of services; 45m of perimeter which is largely taken care of by building on the boundary. Over time the additions to the starter unit creates an enclosed, consolidated private outdoor space. There are thus savings on land and infrastructure costs for the municipality. In addition, the owner of the smaller stand acquires a more manageable property

without compromising on unit size or the ability to generate income from the housing unit through home business or the renting out of rooms. Whilst the outdoor space is considerably smaller it is more useable than the typical 'left over spaces' which are common on conventional stands.

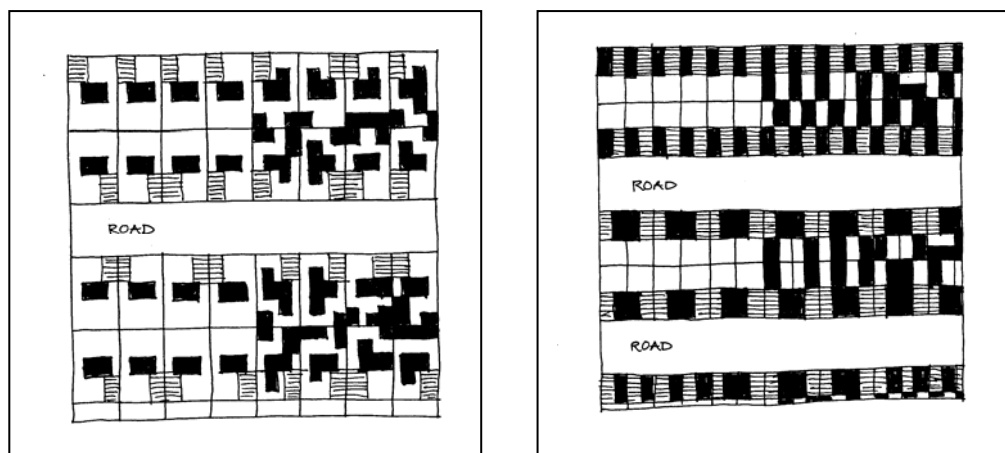


Figure 4: A single hectare of a typical street layout with 250m² stands at a density of 40units/ha (nett) (left) and 112.5m² stands with a density of 80 units/ha (nett) (right).

7 Conclusion

Low-rise, high-density models are by no means new and have a rich and diverse history. Charles Correa, an Indian architect and urban designer, is perhaps the most well known advocate of this housing form. Correa [5] argues that cities should aim for an optimum range between 250 to 1000 persons per hectare. Correa argues that low rise high density housing has a number of crucial advantages:

- It is incremental
- It has great variety
- It is sensitive to the social/cultural/religious determinants of our environment – factors that are of increasing concern in developing countries. It is relatively easy for people to adjust the spaces to suit their own preferred lifestyle.
- It can make for speedier provision (if self built) since an individual building his own house is a highly motivated person
- A low-rise building has a much shorter construction period than a high rise complex
- High-priority construction materials such as steel need not be used
- Maintenance is easier on low-rise buildings.
- Such structures do not require elaborate construction techniques and can be undertaken by what Correa terms the 'bazaar' sector that lacks access to sophisticated plant and equipment. There is thus a powerful alignment between this type of housing and job-creation in the construction sector.

The authors therefore believe that low-rise, high-density housing offers a useful model and should be embraced by the South African government in their stated mission to densify housing and create sustainable settlements.

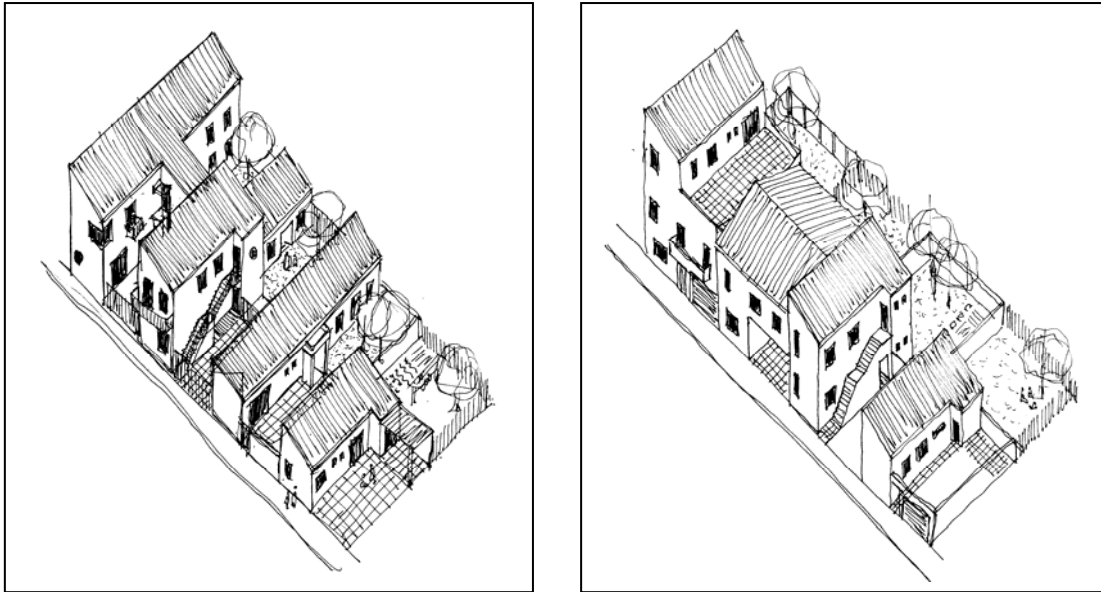


Figure 5: Low rise medium density housing environments offer users opportunity to transform their housing according to their needs

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Reference

- [1] Dewar, D. Settlements, Change and Planning in South Africa since 1994. Judin, H. and Vladislavic, I. (eds.) *Blank___Architecture, apartheid and after*. NAI Publishers, Rotterdam, 1998.
- [2] Zack, T. and Charlton, S. A Somewhat Better Life: Beneficiaries' Perceptions of the Government's Housing Subsidy Scheme. *Housing Finance Resource Programme*, 2003.
- [3] Gibert, A. Some observations about what might be done about rental housing in South Africa. Khan, F. and Thring, P. *Housing Policy and Practice in Post-Apartheid South Africa*. Heinemann, Johannesburg, 2003. pp 388.
- [4] Senior, B.J. Factors affecting Residential Density: A Search for the Zen of Density. Unpublished doctoral thesis, Faculty of Architecture, Johannesburg: University of the Witwatersrand 1984.
- [5] Correa, C. *The New Landscape: Urbanisation in the Third World*. Mimar Books, London, 1989.