



**NUSP**  
National Upgrading Support Programme



# PARTICIPANTS

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Section 8

Layout and Infrastructure



## SECTION 8: LAYOUT AND INFRASTRUCTURE

### Summary

#### Layout approaches

The spatial layout is central to any in situ upgrade of an informal settlement. This includes the plot or block boundaries and the design for the installation of infrastructure, in accordance with

For more details see  
Section 8, item 1.1

that layout. An in situ layout involves creating spaces between existing top-structures for the purposes of access and installing pipes and cables for infrastructure services. The approaches to how these spaces are to be created, depends on a number of factors. These factors include:

- The planned nature of access — for example vehicles or pedestrians.
- The nature of the infrastructure to be provided, for example whether it is interim or permanent.
- Whether the service level is low or full service.

The layout also has direct implications for the type of tenure planned for the settlement.

In the past 14 years, low-income housing development in SA has become dominated by the project-linked subsidy approach. In the case of informal settlements this is the comprehensive upgrading approach through providing physical infrastructure. This approach is referred to as the conventional formal full upgrading approach and involves a once-off capital intensive intervention, the complete redevelopment of the settlement in one project timeframe, demolition of the existing settlement, and redesigning the layout according to set standards. This, in almost all cases, involves significant relocation of residents; for some the relocation will be temporary and for others it will be permanent. Such an approach is often criticised for the monotonous grid-layout, with a low proportion of stands per hectare and little attention is given to affordability and operational cost to municipalities.

The norms and standards for the conventional formal full upgrading approach are minimum requirements which have been set for new developments on vacant land. These norms and standards are not possible to apply, in most cases, to informal settlements without demolishing them and redeveloping them.

The key reason given for using the conventional formal full upgrading approach is the need for safety standards and the public finance requirements. However, there are incremental in situ upgrade approaches that also address the safety standards and public finance requirements.

The National Housing Code introduces the Upgrading of Informal Settlements Programme (UISP) and within this context says the following about the layout and servicing of informal settlements.

For more details see  
Section 8, item 1.2

**National norms and standards** in respect of the creation of serviced plots **do not apply to**

**the UISP**, but can serve as a guideline. Plot sizes should emerge through a process of dialogue between local authorities and residents, taking into account the existing buildings, spaces, roads and pathways in the settlement. The provision of services should also be consistent with the intervention categorisation. Community agreement on stand sizes, densities, levels of services and project phasing is important.

The planning for each settlement begins at the broader strategic or programmatic level. Each informal settlement should be planned for at the strategic level within the broader context of the urban settlement they are located within. Each settlement should be integrated into the municipal planning and budgeting process in terms of the local municipal integrated development planning (IDP) and the spatial development framework in regional and local spatial frameworks or precinct plans. Once an informal settlement is assessed and categorised, the category of intervention will inform what the most appropriate layout approach to be applied is.

For more details see  
Section 8, item 1.3

At the settlement level a set of guiding principles should be agreed between the developer and the community before the layout and infrastructure upgrading design commences.

For more details see  
Section 8, item 1.4

Depending on the categorisation of the settlement, the guiding principles should cover the following issues:

- **Relocation**, i.e. who and how many people get relocated;
- The extent to which there will be **compensation** for top-structure materials or even for loss of livelihoods;
- **Levels of decision-making and community involvement** and what degree of autonomy the community will have over development decisions;
- **Political will and agenda**, i.e. whether the local political representatives are truly prepared to make joint decisions with the community or whether there is a higher political agenda to be met around proposing improvements.

The following factors will influence the approach to layout that is taken at settlement level:

- Certain areas need immediate attention (e.g. precarious lands);
- Certain services may need to be introduced incrementally;
- Some systems are best introduced simultaneously (e.g. pipes and water supply);
- Community priorities regarding the approach and sequence of interventions;
- Budgetary constraints;
- Technical constraints such as geotechnical, bulk infrastructure or even human capacity constraints.

Before any layout can proceed there needs to be a range of more detailed technical studies to determine the feasibility and approach for developing the site. These include land legal studies; geotechnical studies; topographical studies; and a detailed map of existing top-structures mapped by the community or externally.



From the feasibility studies the layout plan will be developed to address such issues as:

- The number of households to be accommodated in the layout
- The type of tenure options
- Which areas cannot be developed and which areas will require special house foundations.
- The 1-in-100 year flood line if applicable, within which no development can be undertaken
- The availability and proximity of bulk infrastructure connections.
- The surrounding main transport routes

All layout designs involve a series of trade-offs with advantages and disadvantages. It is important to ensure broad community consensus on these trade-offs. Some of these trade-offs include plot sizes/densities; plot orientation vs house design and pedestrian vs vehicular access.

For more details see  
Section 8, item 1.5

The layout for an informal settlement upgrading project involves a relatively complex technical design process aimed at achieving the best use of space, reducing relocations and meeting community requirements.

Examples of approaches to layout include superblock layout approach, de facto layouts, re-blocking/blocking-out layouts and rollover layouts.

For more details see  
Section 8, item 1.6

## Infrastructure approaches

In South Africa, there are three broad approaches that have been used for service provision in urban areas. The appropriate choice of approach should be based on an analysis of the characteristics of the informal settlement. The three approaches are:

For more details see  
Section 8, item 2.1

- **A high level of services.**
- **The progressive improvement model.** This model is similar to the above approach except it takes a more incremental approach, and upgrades services in a technically rational and systematic manner.
- **A demand-driven approach with variable levels of service.** Services are designed to meet specific needs and are not related to a structured hierarchy of incremental improvement.

A key point regarding service delivery is that according to the Constitution, local authorities are responsible for local planning and service delivery. Thus, the range of services set out in the table below will be provided in accordance with each individual local authority's existing delivery regime and mechanisms, procedures and capabilities. In cases where the local municipality is not in a position to meet their obligation there is room for negotiation between affected community organisations and the local authorities.

For more details see  
Section 8, item 2.2

Once an up-front preliminary assessment and categorisation of the informal settlement has been undertaken the settlement category will determine the service types and delivery options applicable.

Within each category a range of different servicing options and combinations appropriate for in situ incremental informal settlement upgrading can be provided based on the aims of the project, levels of service decided upon, affordability levels, environmental and resource issues amongst others as illustrated in the table below.

<b>Broad Service Categories</b>	<b>Criteria for Selecting Option (must be agreed to between community and local authority)</b>	<b>Examples of trade-offs to be considered</b>
<ul style="list-style-type: none"> <li>• Accessibility (roads and pathways), mobility and transport</li> <li>• Water and sanitation</li> <li>• Drainage and erosion control</li> <li>• Community facilities</li> <li>• Bulk earthworks</li> </ul>	<ul style="list-style-type: none"> <li>• Aims of the project</li> <li>• Levels of services</li> <li>• Affordability               <ul style="list-style-type: none"> <li>○ Capital</li> <li>○ Maintenance</li> </ul> </li> <li>• Budgets               <ul style="list-style-type: none"> <li>○ Capital</li> <li>○ Maintenance</li> </ul> </li> <li>• Environmental constraints (e.g. geotechnical) and resource usage</li> <li>• Local employment opportunities               <ul style="list-style-type: none"> <li>○ Construction</li> <li>○ Maintenance</li> </ul> </li> <li>• Local capacity building</li> </ul>	<ul style="list-style-type: none"> <li>• Costs: capital vs maintenance</li> <li>• Levels of different services: selection based on budgetary constraints</li> <li>• Timing of delivery: labour vs capital intensive construction</li> <li>• Convenience: Ease of use vs environmental imperatives vs affordability</li> <li>• Political imperatives: Desired infrastructure vs technical practicalities</li> </ul>

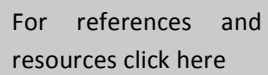
The table below gives an overview of a range of project level services and examples of infrastructure options and their application to different settlement types. These examples are provided to inform negotiations around service level decisions.

Service Category	Type	Application to informal settlement categories (Y: Yes/ N: No)			
		Conventional formal full upgrading	Incremental full upgrading	Interim arrangements	Deferred relocation
<b>Accessibility mobility and transport</b>	Pedestrian and cycle circulation	Y	Y	Y	Y
	Gravel or unsurfaced road circulation	N	Y	Y	N
	Surfaced roads	Y	Y	N	N
<b>Drainage and erosion control</b>	Use of roadways and pedestrian paths as drainage channels	Y	Y	Y	Y
	Use of piped system within the roadways and pedestrian paths as drainage channels	Y	Y	N	N
<b>Water</b>	Water tanker or vendor	N	N	Y	Y
	Individual water butt/drum	Y	Y	Y	N
	Individual well on each plot or borehole with or without pump	N	Y	N	N
	Public standpipes	N	Y	Y	N
	Yard tap	Y	Y	N	N
	House connection	Y	Y	N	N
<b>Sanitation</b>	Communal system	N	Y	Y	Y
	Night soil collection	N	N	N	Y
	Chemical toilets	N	N	N	Y
	Ventilated pit latrines	N	Y	Y	N
	Ventilated vault toilet	N	Y	Y	N
	Settled sewage system or soak pit system	Y	Y	N	N
	Composting toilet or urine diverting dry toilet	Y	Y	N	N
<b>Street lighting and household electivity supply</b>	WC waterborne sewage	Y	Y	N	N
	Street lights – below ground	Y	N	N	N
	Street lights – above ground	Y	Y	N	N
	Mast lights	Y	Y	Y	N
	Photovoltaic street lights	Y	Y	N	N

The key funding mechanisms for layout and infrastructure are:

- UISP: Provides funding for land acquisition, pre-planning, detailed town planning, land surveying, interim basic services and permanent engineering services.
- USDG: Provides funding principally for basic services (e.g. water supply, roads, sanitation, etc.) for metropolitan municipalities.
- IRDP: Provides funding for land acquisition, pre-planning, detailed town planning, land surveying, and infrastructure installation.
- MIG: Provides funding principally for basic services (e.g. water supply, roads, sanitation, etc.) for non-metropolitan municipalities and for bulk infrastructure.

- Emergency housing: Provides funding for basic infrastructure where emergency housing is being provided.
- Municipality: It is assumed that the municipality will need to cover the costs of the other initiatives if the above scenarios apply.



For references and  
resources click here



# Content

## 1. Layout approaches

The spatial layout is central to any in situ upgrade of an informal settlement. This includes the plot or block boundaries and the design for the installation of infrastructure, in accordance with that layout. An in situ layout involves creating spaces between existing top-structures for the purposes of access and installing pipes and cables for infrastructure services.

The approaches to how these spaces are to be created, depends on a number of factors. These factors include:

- The planned nature of access — for example vehicles or pedestrians;
- The nature of the infrastructure to be provided, for example whether it is interim or permanent;
- Whether the service level is low or full service.

The layout also has direct implications for the type of tenure planned for the settlement.

Another key aspect of in situ upgrading layouts is that they should be undertaken with the understanding that the services will be upgraded and top-structures improved incrementally. This means that the layout should be designed in such a manner that the tenure and infrastructure services can be improved over time without the layout having to be redesigned. As detailed below this is a fundamental departure from the one-size-fits-all approach to layout planning and infrastructure provision for informal settlements.

### 1.1 One-size-fits-all

In the past 14 years, low-income housing development in SA has become dominated by the project-linked subsidy approach. In the case of informal settlements this is the comprehensive upgrading approach through providing physical infrastructure. This approach is referred to as the conventional formal full upgrading approach and involves a one-off capital intensive intervention, the complete redevelopment of the settlement in one project timeframe, demolition of the existing settlement, and redesigning the layout according to set standards. This, in almost all cases, involves significant relocation of residents; for some the relocation will be temporary and for others it will be permanent.

The conventional formal full upgrading approach is covered in Section 5 and relocations in Section 6.

The norms and standards for the conventional formal full upgrading approach are minimum requirements which have been set for new developments on vacant land. These norms and standards are not possible to apply, in most cases, to informal settlements without demolishing them and redeveloping them. The package of standards for conventional full upgrading, with a top-structure, includes:

- Freehold tenure in the form of registered ownership;
- A minimum of a 250 m<sup>2</sup> stand and 40 m<sup>2</sup> top-structure;
- A fully subsidised top-structure of a minimum of two bedrooms;
- A serviced stand, with water on the stand, and water-borne sewerage;
- A hierarchy of roads and road reserves which is a system of grades of roads ranked one above the other i.e. large roads to link the settlement to the outside and small roads within the settlement to access individual houses.
- Stormwater management and drainage.

Such an approach is often criticised for the following reasons:

- The monotonous grid-layout, with a low proportion of stands per hectare;
- Little attention is given to affordability and operational cost to municipalities. This often results in municipalities not having funds to actually undertake the upgrade;
- The slow rate of development, while residents are housed in temporary and often difficult conditions. Although an incremental in situ upgrade takes significantly longer the residents are not displaced and are impacted upon less during the upgrade process;
- The tendency to favour development of open land, rather than using places where people are already living, i.e. demolition and redevelopment;
- Often the sites provided for education and social facilities are left empty for years and become places for waste dumping or further informal settlement;
- Little attention is paid to top-structure orientation and greening.

The key reason given for using the conventional formal full upgrading approach is the need for safety standards and the public finance requirements. However, there are incremental in situ upgrade approaches that also address the safety standards and public finance requirements.

## 1.2 UISP approach to layout and services

The National Housing Code introduces the Upgrading of Informal Settlements Programme (UISP) and within this context says the following about the layout and servicing of informal settlements:

- **National norms and standards** in respect of the



creation of serviced plots **do not apply to the UISP**, but can serve as a guideline;

- **Plot sizes:** The layout of informal settlements generally precludes the determination of uniform plot sizes. Plot sizes should emerge through a process of dialogue between local authorities and residents, taking into account the existing buildings, spaces, roads and pathways in the settlement;
- **Service standards:** The UISP provides funding for the installation of interim and permanent municipal engineering services. Where interim services are to be provided this must always be undertaken on the basis that such interim services constitute the first phase of the provision of permanent services. The provision of services should also be consistent with the intervention categorisation;
- **Participation:** The nature and level of permanent engineering infrastructure must be the subject of engagement between the local authority and residents. Community agreement on stand sizes, densities, levels of services and project phasing is important. Community needs must be balanced with community preferences, affordability indicators and sound engineering practice, as well as the UISP subsidy quantum and level of services provided.

Programme level	√
Settlement level	

### 1.3 Layout issues at the programme level

The planning for each settlement begins at the broader strategic or programmatic level. As outlined earlier in the course, there is a broad range of programmatic and integrated strategic planning which goes beyond just housing and associated basic infrastructure, in terms of integrated settlement planning, bulk infrastructure, public transport and the provision of key social facilities.

Each informal settlement should be planned for at the strategic level within the broader context of the urban settlement they are located within.

Categorisation is outlined in Section 5.

Each settlement should be integrated into the municipal planning and budgeting process in terms of the local municipal integrated development planning (IDP) and the spatial development framework in regional and local spatial frameworks or precinct plans.

Programme level	
Settlement level	√

Once an informal settlement is assessed and categorised, the category of intervention will inform what the most appropriate layout approach to be applied is.

### 1.4 The layout plan at settlement level

#### Guiding principles

At the settlement level a set of guiding principles should be agreed between the developer and the community before the layout and infrastructure upgrading design commences.

Depending on the categorisation of the settlement, the guiding principles should cover the following issues:

- **Relocation**, i.e. who and how many people get relocated;
- The extent to which there will be **compensation** for top-structure materials or even for loss of livelihoods;
- **Levels of decision-making and community involvement** and what degree of autonomy the community will have over development decisions;
- **Political will and agenda**, i.e. whether the local political representatives are truly prepared to make joint decisions with the community or whether there is a higher political agenda to be met around proposing improvements.

## Factors that will influence the approach to the layout

The following factors will influence the approach to layout that is taken at settlement level:

- Certain areas need immediate attention (e.g. precarious lands);
- Certain services may need to be introduced incrementally;
- Some systems are best introduced simultaneously (e.g. pipes and water supply);
- Community priorities regarding the approach and sequence of interventions;
- Budgetary constraints;
- Technical constraints such as geotechnical, bulk infrastructure or even human capacity constraints.

Bulk infrastructure is the infrastructure which provides the overall capacity to the local networks within suburbs. It includes for example reservoirs, purification plants, bulk outfall or supply

It must be noted that the layout of the settlement is ultimately the responsibility of the local municipality, as they will be expected to maintain the public spaces (all areas other than the residential stands) and utilities within these spaces into the future. These might include the roadways, footpaths, play areas and storm water drainage systems.

Geotechnical refers to site conditions and design and construction recommendations to the road and services design as a result of this. It is based on below-ground investigation by boring, sampling, and testing the soil strata to establish its compressibility, strength, and other characteristics.

## Technical issues that affect the layout plan

Before any layout can proceed there needs to be a range of more detailed technical studies to determine the feasibility and approach for developing the site. These include:

- land legal studies;
- geotechnical studies;
- topographical studies; and
- a detailed map of existing top-structures mapped by the community or externally.

Topographical studies are a graphic representation of the surface features of a place or region on a map, indicating their relative positions and heights.



From the feasibility studies the layout plan will be developed to address such issues as:

- The number of households to be accommodated in the layout, determined through the settlement mapping and community surveys;
- The type of tenure options based on the land legal investigation, which in turn will determine the type of boundaries to be laid out (either site by site, superblocks or settlement-wide boundary definition);
- The geotechnical studies will inform which areas cannot be developed and which areas will require special house foundations. The type of soil will inform what sanitation options are possible. Depending on the soil conditions they may also impact on the minimum plot sizes possible and if on site sanitation options are to be considered;
- A flood line study will determine the 1-in-100 year flood line if applicable, within which no development can be undertaken;
- A slope analysis will show how steep the slopes are. Beyond a 1:3 slope, development will require expensive retaining walls. The slope analysis will also inform the alignment of the roads/pathways;
- The directions of the slopes will also inform how houses can be improved upon, for example which direction they should face to maximise sunlight for solar power and warmth;
- Another key issue that must be addressed is the availability and proximity of bulk infrastructure connections. This determines whether the settlement requires interim services until such time as the bulk infrastructure can reach the settlement;
- The surrounding main transport routes may determine where the main route through the settlement should be to connect with the surrounding areas and to promote economic activities.

Settlement mapping and community surveys are outlined in Modules 2 and 4. Tenure options are outlined in Section 7.

A flood line study measures the risks of flooding of rivers and other water areas. It is expressed as a line on a map and is determined on the basis of average flood levels in previous years (10, 20, 50 and 100 years)

## 1.5 Trade-offs and layout planning

All layout designs involve a series of trade-offs with advantages and disadvantages. It is important to ensure broad community consensus on these trade-offs. Some of these trade-offs include:

- Plot sizes/densities;
- Plot orientation vs house design. The orientation of the plots along or down a slope determines whether and how a house can be expanded and how much sun it receives and is often a trade-off between these elements;

- Pedestrian vs vehicular access. Often by providing only pedestrian access, more plots can be created in the settlement. Vehicular access requires minimum widths and slope gradients and usually results in more relocations.

The layout for an informal settlement upgrading project involves a relatively complex technical design process aimed at achieving the best use of space, reducing relocations and meeting community requirements. For example, in the activity above, you identified some of the advantages and disadvantages, or trade-offs, of small or large plots.

#### **Small plots:**

- Advantages:
  - Reduced land costs which allows more money to be available for building and on-plot utilities;
  - Reduced layout and infrastructure servicing costs;
  - More households can be provided with a plot in any given area;
  - Reduced risks of higher income groups benefiting from the project.
- Disadvantages:
  - More difficult and expensive to develop housing on the plot;
  - Reduced possibilities of on-site sanitation options;
  - Reduced opportunities for expanding the house.

#### **Large plots**

- Advantages:
  - Private open space for growing crops, keeping domestic animals and expanding the house;
  - Space available for providing additional rooms for rental or commercial use;
  - Greater opportunities for on-site sanitation disposal.
- Disadvantages:
  - Higher total land costs per plot;
  - Higher layout and plot servicing costs;
  - Reduced number of households can be accommodated in the settlement;
  - Greater risk of attracting higher income groups not intended for the project.

A broad set of layout approaches can be identified as set out below.

## **1.6 Examples of approaches to layout**

### **Superblock layout approach:**

This approach to the layout involves the following actions:

- First identify and map the existing movement tracks, pathways and desired lines through the informal settlement;

- From this map, design a proposed movement network or public space structure using the existing movement system as a basis for the proposed system;
- This results in a system of large land parcels or blocks defined by the movement paths, containing multiple household top-structures;
- Formally survey and proclaim these parcels or superblocks to create a street layout and new addresses and street names. These superblocks then receive some form of collective/incremental tenure arrangement, i.e. administrative or legal recognition, for all the households within them;
- This recognition, in turn, enables funding for some form of collective services e.g. standpipes and communal toilets to be installed per block;
- At a later stage these blocks can be further sub-divided and individual title provided to qualifying beneficiaries, followed by some form of individual household services being installed, e.g. yard taps.

### **Example 1: Superblock layout: Monwabisi Park, Cape Town**

Monwabisi Park (MWP) is an informal settlement of some 5 500 households located along the southern boundary of Khayelitsha, Cape Town's largest township. It was formed in 1997, when people began to build shacks on an adjacent, unoccupied nature reserve. Some 20 000 people, the majority from the Eastern Cape, now live in MWP. Although they are only 20 km from the central business district of Cape Town, most MWP residents have yet to find an economic foothold. Some 80% of households earn less than the minimum monthly subsistence level of R1 900.

The Indlovu Project began in 2005 when the Shaster Foundation joined forces with a local street committee leader and the founder of a small crèche that became the first Indlovu Centre building. In 2007, Worcester Polytechnic Institute (WPI) an American technical university, began working with the Indlovu project on a redevelopment plan for the settlement.

The over-arching vision of the project was to forge a partnership between a diverse network of stakeholders to help the community grow from a vibrant, but impoverished squatter camp into a healthier, safer and more prosperous eco-village. Developing the layout of the upgrade followed the process outlined above. This process will be illustrated in the Section training session through slides showing the maps and diagrams.





The movement paths were mapped through the existing dense settlement.



The existing tracks and pathways were used as a basis for the layout design. Superblocks were created based on the movement network.



Superblocks were created based on the movement network.



*Note: This case study is used as an example only to highlight a specific aspect or issue.*

The superblock layout approach is more applicable in urban areas where the densities of the settlements are generally high, providing limited space between the existing top-structures. This approach is also most applicable to incremental upgrading i.e. Category B1-type settlements for both tenure arrangements and infrastructure provision. As such the following advantages and disadvantages (pros and cons) of this approach are set out:

Pros	Cons
<ul style="list-style-type: none"> <li>• Superblocks are an in situ approach which results in minimal displacement as it uses existing pathways and roadways in the settlement to define blocks and provide improved access routes.</li> <li>• Layout can be undertaken quite quickly as one is not dealing with individual household boundaries, rather superblocks.</li> <li>• Rapid legal recognition can be facilitated for the settlement to receive interim services.</li> <li>• The approach provides a spatial pattern and spaces for short-term/interim collective infrastructure provision.</li> <li>• It is compatible with public finance requirements.</li> <li>• It is ideal for incremental tenure arrangements in that the superblock can provide communal land security in the short-term. Thereafter they can be further subdivided to provide individual freehold tenure if required.</li> </ul>	<ul style="list-style-type: none"> <li>• Superblocks may require some relocation of residents for public facilities such as parks, schools, public buildings.</li> <li>• Inappropriate layout for immediate individual services installation and tenure arrangements, because individual plot boundaries are not demarcated around each top-structure.</li> </ul>

## De facto layouts

This approach involves an in situ design based on the principles of minimal disruption to existing structures, and involves the following steps:

- Undertake a survey of each household to determine the residents' perceived land boundaries, using a GPS;
- Convert the GPS points into lines on a map. Some of these lines may overlap (indicating that there is an overlap in some of the residents' perceptions of their land

i.e. dual claims to land) (see figure below). These lines also show the existing movement system of pathways and roads through the settlement;

- Through negotiation with the residents agree on how to adapt the existing lines into individual stand boundaries around each existing top-structure. At the same time, demarcate (set out space for) a minimum 5 m wide vehicular access strip along existing access routes through the area. Where necessary one may only be able to demarcate 2 m wide pedestrian access strips. Ensure that each stand has some form of access.

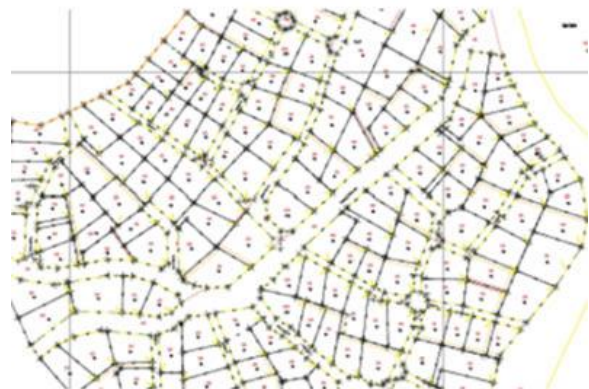
## Example 2: De facto layouts: Kwadabeka C, eThekweni

This was a project initiated by the municipality involving a greenfields area of approximately 73 ha and an informal settlement covering approximately 25 ha. The informal settlement lay immediately to the north of the greenfields area. The informal settlement within the project area consisted of 289 structures. 452 greenfields plots of average 312 m<sup>2</sup> size (180 m<sup>2</sup> minimum) plus 260 in situ/de facto plots of average 328 m<sup>2</sup> (minimum 180 m<sup>2</sup>) were laid out. The boundaries of the de facto sites were determined through consultation with each household. Once the layout was approved the municipality temporarily relocated all the households in the informal settlement, demolished the shacks and rebuilt RDP houses in their place. The project started in 2003 and was completed in 2011.

Map showing the boundaries around each top-structure. Note how the shape and size of each stand varies; how there is left-over space in between some boundaries and how in some places there is no space between boundaries for roads



Map showing reconciled and negotiated draft boundaries making up the layout of the informal settlement upgrade.



This approach is most appropriate when the settlement is not too dense (i.e. mostly individual top-structures with a little yard around them). These types of densities are commonly found on the periphery of the metropolitan areas, and in the expansion area of small towns. This layout approach would be most appropriate for settlements being upgraded including conventional formal full upgrading (Category A) and incremental full upgrading (Category B1) as the layout determines the final road and plot subdivisions/boundaries, facilitating township establishment and full service provision.

Some of the key considerations to be noted when applying this layout approach include:

- Desired density of residential structures per hectare to be achieved, with agreement from the beneficiaries;
- Linked to the above, there should be pre-design agreements on the plot size variations permitted given the range of top-structure sizes.

Pros	Cons
<ul style="list-style-type: none"> <li>• Minimal displacement of existing top- structures.</li> <li>• During the planning process there is engagement with every household.</li> <li>• Site by site engagement often results in greater transparency and support for the ultimate layout.</li> <li>• Final negotiated layout can be used for final freehold tenure acquisition.</li> </ul>	<ul style="list-style-type: none"> <li>• Not applicable to high density settlements where top-structures are attached and individual boundaries cannot be demarcated around each top-structure.</li> <li>• Could result in a variety of site sizes based on the size of the existing top-structure on the site, which might be an issue if the community wants or expects equal sized sites.</li> <li>• Irregular site boundaries can contribute to higher servicing costs, as it may result in more service pipe joints and man-holes.</li> </ul>

## Re-blocking/blocking-out layouts

Re-blocking or blocking out is a way of improving the planning of informal settlements. Put more simply, it refers to a re-arrangement of shacks in an informal settlement with community consent. This form of layout focuses on the larger concept of spatial reconfiguration versus the simple delineation of sites i.e. the focus is not on individual households and space, but rather on the communal spaces used by the whole community. The spaces created through re-blocking are used for communal amenities, or to create lanes for installation of services such as water, sanitation and electricity. It can also increase tenure security in the short-term and demonstrates community capacity with regard to planning.

There are variations in the re-blocking approach, from a comprehensive re-blocking (where the entire settlement is re-blocked) to the partial re-blocking approach (i.e. where only those areas requiring de-densification for roads, health reasons and services installation are re-blocked). This is illustrated in the examples below of Mshini Wam and Ruimsig.

### Example 3: Re-blocking: Mshini Wam, Cape Town



[Click here for video on Mshini Wam Re-blocking](#)

Mshini Wam is an informal settlement located in what was an open space between RDP houses in the greater Joe Slovo Park, in Milnerton, Cape Town. The re-blocking project was launched in May 2012 and completed in March 2013, and involved the creation of spaces for roads and public spaces by re-arranging 250 shacks in accordance with a community-designed layout plan. The project was the first collaboration between the Informal Settlement Network (ISN), the Community Organisation Resource Centre (CORC), and the City of Cape Town, through a Memorandum of Understanding. A savings scheme was set up to collect community contributions for new top-structures, which came to 20% of the total cost. Furthermore 45 expanded public works project jobs were created during the project. A local steering committee saw to the design, planning, savings co-ordination, demolition and construction phases of the project.

To date the community has completed enumerations (recording of information on the existing residents of settlement), mapped the settlement and created a settlement layout for the re-blocking process. This was undertaken through the use of little cardboard pieces cut to scale on a cadastral map of the site. The method used here was

to create a three dimensional model of the settlement to assist community members to plan the re-blocking. The community is currently working to develop a gutter system to direct rain to drains that the city will install in order to reduce flooding. The community is also planning to use fire resistant materials when rebuilding their houses. The city will partner with the community to provide sewer and water lines, as well as electrical poles and electrical boxes to each family.

Ultimately the project will provide 250 households with better housing and services, with the possibility of a stronger community as it works together to create a savings base.

#### Example 4: Re-blocking: Ruimsig, Johannesburg

Ruimsig is another re-blocking upgrade located on the West Rand of the Johannesburg metropolitan area. The objective of the project is to reduce congestion and densities for safer areas for children to play, and so that shacks can be improved and basic services can be upgraded.

The project involves two phases. The first was undertaken in 2011 with the re-blocking of 38 shacks from the flood-prone wetlands area, and the second phase is the re-blocking of 96 shacks which commenced in 2012. To date 42 of these shacks have been re-blocked. The total project was budgeted at R341 000 of which the community contributed 16% of the funds.

Mapping of the settlement for the re-blocking process was undertaken jointly by University of Johannesburg students and community members, through an agreement between the university and the community.

Re-blocking is most appropriate in higher density informal settlements, where de-densification is needed in order to install services. It is also appropriate where the community and the developer have decided to use this approach after considering the pros and cons (advantages and disadvantages) of its implementation.

[Click here for video on Ruimsig Re-blocking](#)

Some of the key considerations to be noted for the re-blocking approach include:

- What the final desired densities to be achieved will be. This must be done with agreement from the beneficiaries;
- Whether the re-blocking is an interim measure for interim services or whether it is permanent. In both cases the boundaries around each top-structure need to be considered in terms of the eventual tenure status.

The pros and cons of the re-blocking approach are set out below.

Pros	Cons
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<ul style="list-style-type: none"> <li>• The re-block process involves intensive engagement with the existing residents, ensuring co-operation and buy in to the layout.</li> <li>• Minimum displacement of residents from the settlement.</li> <li>• Can quickly provide a spatial pattern and spaces for short-term/interim collective infrastructure provision.</li> <li>• Compatible with public finance requirements.</li> <li>• New fire-resistant metal structures, coupled with the creation of space between rows of shacks, greatly reduce the risk of fire. These spaces are specifically designed to allow the passage of large emergency vehicles.</li> <li>• Soil compacting techniques applied after re-blocking and introduction of grading reduces the amount of standing water after rainstorms.</li> <li>• Large scope for local job opportunities to undertake the process.</li> <li>• Re-blocking facilitates an incremental approach by providing short-term spaces into which access and interim services can be provided, as well as communal tenure security.</li> </ul>	<ul style="list-style-type: none"> <li>• Moving of top-structures could result in damage and therefore a need for a replacement budget.</li> <li>• A re-blocking layout may make it difficult to acquire freehold tenure, because no individual plots are demarcated, rather large superblocks facilitating an incremental tenure security approach.</li> </ul>
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## Rollover layouts

This approach entails the demolition of the entire informal settlement, either incrementally or in one timeframe. The existing residents are relocated to transitional residential areas and the original site is redeveloped as a subsidised RDP project. The intention is that, on completion, the original residents of the informal settlement move back into the newly developed area.

Experience has shown that many people in informal settlements do not qualify as beneficiaries for subsidised housing and are excluded from the new upgraded development. Furthermore, the resultant greenfield layouts are often designed according to Housing Code housing standards (as set out in section 1.1 of the Housing Code). This produces lower

density settlements, and only a portion of the temporarily displaced households can be re-accommodated back into the new development. To offset this problem residents are often re-accommodated into multi-storey flats in situ. There needs to be funding and agreement from the community for such an option. An example of this approach is the N2 Gateway case study (see below).

If not carefully planned this approach could result in a significant displacement of people, destruction of people's livelihoods and limited opportunities for communities to benefit from incremental upgrading aspects.

This approach is appropriate for Category A or Category B1 informal settlements.

### **Example 5: Rollover: Gateway Project, Cape Town**

The N2 Gateway Housing Pilot Project is a large house building project under construction in Cape Town. It is a joint endeavour between the National Department of Human Settlements, the provincial government of the Western Cape and the City of Cape Town. A private company, Thubelisha, has been outsourced to manage and implement the project. Thubelisha estimates that some 25 000 units will be constructed, about 70% of which will be allocated to shack-dwellers, and 30% to backyard dwellers on the municipal housing waiting lists. Many of these units have been completed. Due to land availability issues the project is split into two areas, a site on the N2 some 15 km from Cape Town, and a site in Delft, some 40 km outside of Cape Town. To facilitate this development some 20 000 informal dwellers that had previously been living on the N2 site had to be displaced to temporary residential areas (TRAs) in Delft.

In its early years, the N2 Gateway was criticised by the Geneva-based Centre on Housing Rights and Evictions, by the South African Auditor General, by popular organisations such as the Western Cape Anti-Eviction Campaign, by Constitutional Court experts such as Pierre De Vos, and by affected residents themselves. Essentially these criticisms were around the slow delivery of houses, (meaning people have had to spend significant periods in temporary residential areas) poor construction, protests, rent boycotts and forced evictions. The residents raised critical issues concerning the location of Delft on the periphery of the city and its impact on their rights to work, education and healthcare amongst others.

More recently the project has received less criticism, partly due to the comprehensive management programme implemented around the issue of temporary relocations by the Housing Development Agency (HDA), which is illustrated in a video available from the HDA. These have included improved quality of TRA units, legal certificates for temporary residence, and weekly monitoring of each household within the TRA to ensure the TRA is well-managed.

*Note: This case study is used as an example only to highlight a specific aspect or issue.*

The key considerations pertaining to a rollover approach are:



- Ensuring a mechanism is put in place (comprehensive management plan) to determine who is displaced and who can remain;
- Whether well-located alternative land is available;
- Whether the locality and value of the site warrants the demolition, temporary relocation and reconstruction of the settlement at higher density typologies.

The pros and cons of the rollover approach are set out below.

Pros	Cons
<ul style="list-style-type: none"> <li>• Norms and standards can be adhered to in terms of minimum lot sizes and road dimensions and maximum efficiency of space can be achieved.</li> <li>• Often results in the maximum efficient use of space and more uniform/equi-sized stands.</li> <li>• It is often more cost-effective to install services due to straight service lines.</li> <li>• Fits with public finance requirements.</li> <li>• Provides space for education and social facilities.</li> </ul>	<ul style="list-style-type: none"> <li>• Growing shortage of well-located land (often the cause of blocked projects).</li> <li>• Vacant land often needs bulk infrastructure which is extremely expensive.</li> <li>• In accordance with minimum lot sizes these layouts are often very low density, thus contributing to urban sprawl. This is exacerbated in areas of steep topography to accommodate the cut and fill platforms.</li> <li>• In adhering to standards these layouts often result in significant levels of displacement of existing residents (another frequent cause of blocked projects).</li> <li>• These layouts often negate community participation because they are undertaken in areas removed from the community.</li> <li>• Little attention is paid to top-structure orientation.</li> </ul>

## 2. Infrastructure approaches

### 2.1 Infrastructure delivery approaches in South Africa

In South Africa, there are three broad approaches that have been used for service provision in urban areas. The appropriate choice of approach should be based on an analysis of the characteristics of the informal settlement.

Programme level	✓
Settlement level	

These characteristics include economic and environmental sustainability and political imperatives. The first approach tends to be the most commonly used by municipalities in South Africa and is most often applied in cases of relocation or rollover interventions. The three approaches are:

- **A high level of services.** There are financial arguments against this option for low income communities. However, if community participation in decision-making is to be meaningful, demand for high level services can stem from within communities and this demand needs to be addressed effectively. This is particularly true where there is a strong grassroots political organisation. Decentralising decisions on policy needs to be addressed if there is to be long-term sustainability. The future status of the area within a wider metropolitan context must be addressed, rather than limiting the basis of the decision on service levels to the ability to pay. The ability to pay may be defined within a historical and artificially demarcated geographical context.
- **The progressive improvement model.** This model is similar to the above approach except it takes a more incremental approach, and upgrades services in a technically rational and systematic manner. In theory there can be several entry points. In practice it is likely to begin with basic services.
- **A demand-driven approach with variable levels of service.** Here the emphasis is on developing the community in its widest sense, rather than focusing on capacity building. There is a balance between the political and economic components of decision-making, between policy and implementation. The technical aspect provides a supportive, rather than a determining role within the wider decision-making process. The central issue is the community's right to choose, and that this right is not governed solely by the criterion of affordability. Instead it has to take cognisance of wider social and political factors. In this model, services are designed to meet specific needs and are not related to a structured hierarchy of incremental improvement.

## Example 5: eThekwini Interim Service Programme

Earlier you used the case study of the eThekwini Interim Service Programme as an example of interim services and institutional arrangements.

eThekwini is in the process of establishing a pro-active and broad-based programme aimed at providing a range of basic interim services to 166 prioritised informal settlements within the municipality, with a view to addressing a range of basic health and safety issues. These prioritised settlements are those which are on the municipality's housing plan, but which cannot be provided with full services and a top-structure in the short-term. Those settlements which are destined for eventual relocation are not included. The interim services programme will provide a mix of basic interim services as follows:

- Communal ablution blocks;
- A basic road network and footpaths;
- Electricity connections;
- Water standpipes;
- Key social facilities such as fire and police stations, clinics, schools.

Sustainable livelihoods will be addressed through use of local labour and community-based maintenance. In order to build stronger community responsibility and self-help, local residents are being supported to develop practical action plans which would empower them to play a more effective role in a range of spheres such as special needs (e.g. home-based care, crèches and HIV Aids), micro-enterprise and food security.

In providing the above a spatially coherent approach has been adopted whereby informal settlements have been grouped together into logical clusters or precincts in order to enable more effective and sustainable urban planning. This case study is an example of a municipal approach to address interim service provision at a programmatic level to get the widest possible impact.

## 2.2 Project level infrastructure responses to informal settlements

This section will examine project level service delivery responses to informal settlements in relation to the various types of interventions outlined in Section 6.

A key point regarding service delivery is that according to the Constitution, local authorities are responsible for local planning and service delivery. Thus, the range of services below will be provided in accordance with each individual local authority's existing delivery regime and mechanisms, procedures and capabilities. In cases where the local municipality is not in a position to meet their obligation there is room for negotiation between affected community organisations and the local authorities.

Once an up-front preliminary assessment and categorisation of the informal settlement has been undertaken the settlement category will determine the service types and delivery options applicable.

Within each category a range of different servicing options and combinations appropriate for in situ incremental informal settlement upgrading can be provided based on the aims of the project, levels of service decided upon, affordability levels, environmental and resource issues amongst others as illustrated in the table below.

Broad Service Categories	Criteria for Selecting Option (must be agreed to between community and local authority)	Examples of trade-offs to be considered
<ul style="list-style-type: none"> <li>• Accessibility (roads and pathways), mobility and transport</li> <li>• Water and sanitation</li> <li>• Drainage and erosion control</li> <li>• Community facilities</li> <li>• Bulk earthworks</li> </ul>	<ul style="list-style-type: none"> <li>• Aims of the project</li> <li>• Levels of services</li> <li>• Affordability               <ul style="list-style-type: none"> <li>○ Capital</li> <li>○ Maintenance</li> </ul> </li> <li>• Budgets               <ul style="list-style-type: none"> <li>○ Capital</li> <li>○ Maintenance</li> </ul> </li> <li>• Environmental constraints (e.g. geotechnical) and resource usage</li> <li>• Local employment opportunities               <ul style="list-style-type: none"> <li>○ Construction</li> <li>○ Maintenance</li> </ul> </li> <li>• Local capacity building</li> </ul>	<ul style="list-style-type: none"> <li>• Costs: capital vs maintenance</li> <li>• Levels of different services: selection based on budgetary constraints</li> <li>• Timing of delivery: labour vs capital intensive construction</li> <li>• Convenience: Ease of use vs environmental imperatives vs affordability</li> <li>• Political imperatives: Desired infrastructure vs technical practicalities</li> </ul>

The table below gives an overview of a range of project level services and examples of infrastructure options. These examples are provided to inform negotiations around service level decisions. Details on the example options are provided in the handout ‘Service Level Examples’. Some of the options available for each service are described, including the characteristics, layout implications, employment and social capital development opportunities, and the advantages and disadvantages. As indicated previously, each option or combination of options involves trade-offs, balancing the advantages and disadvantages of each service option. Note: the list provides only a set of examples; it is not a definitive list of service options.

Service Category	Type	Characteristics	Application to informal settlement categories (Y: Yes/ N: No)				Opportunities for local labour
			Conventional formal full upgrading	Incremental full upgrading	Interim arrangements	Deferred relocation	
<b>Accessibility mobility and transport</b>	Pedestrian and cycle circulation	These are paved, or tarred narrow strips which can be constructed on steep gradients requiring limited cut and fill. In very steep areas stairs can even be provide.	Y	Y	Y	Y	Y
	Gravel or unsurfaced road circulation	These are unpaved roads which require at least 6 metre widths and minimum radius curvature on turns and minimum 1:5 gradients requiring cut and fill embankments in steep terrain. In very steep areas road access is not possible.	N	Y	Y	N	Y
	Surfaced roads	These are paved or tarred roads which require at least 6 metre widths and minimum radius curvatures on turns and minimum 1:5 gradients requiring cut and fill embankments in steep terrain. In very steep areas road access is not possible.	Y	Y	N	N	Y
<b>Drainage and erosion control</b>	Use of roadways and pedestrian paths as drainage channels	Surface of road used as a drainage channel to direct water run-off into soak-aways or retention dams.	Y	Y	Y	Y	Y
	Use of piped system within the roadways and pedestrian paths as drainage channels	Stormwater pipes running below the road kerbs and where the water run-off from the road flows into a kerb inlet.	Y	Y	N	N	Y

Service Category	Type	Characteristics	Application to informal settlement categories (Y: Yes/ N: No)				Opportunities for local labour
			Conventional formal full upgrading	Incremental full upgrading	Interim arrangements	Deferred relocation	
<b>Water</b>	Water tanker or vendor	Supply from tanker or from kiosks.	N	N	Y	Y	Y
	Individual water butt/drum	Water collected from roofs and stored on plot.	Y	Y	Y	N	N
	Individual well on each plot or borehole with or without pump	Individual well on each plot or borehole with or without pump.	N	Y	N	N	N
	Public standpipes	Piped network throughout the settlement with standpipes at regular intervals (within 200 m of each dwelling according to national regulations) and can be associated with an on-site storage facility.	N	Y	Y	N	Y
	Yard tap	Piped water supply to a tap standing outside the house, metered supply.	Y	Y	N	N	Y
	House connection	Piped water supply to inside the house, metered water supply.	Y	Y	N	N	Y
<b>Sanitation</b>	Communal system	A block of toilet facilities provided for communal use. A range of levels can be provided from flush latrine to piped network.	N	Y	Y	Y	Y
	Night soil collection	Removable bucket provided by the local authority placed below a toilet seat, outside a house.	N	N	N	Y	Y
	Chemical toilets	An off-site, non-reticulated sanitation service, normally used where temporary sanitation services are required for relatively short periods.	N	N	N	Y	Y

Service Category	Type	Characteristics	Application to informal settlement categories (Y: Yes/ N: No)				Opportunities for local labour
			Conventional formal full upgrading	Incremental full upgrading	Interim arrangements	Deferred relocation	
	Ventilated pit latrines	On-site sewage disposal system.	N	Y	Y	N	Y
	Ventilated vault toilet	An on-site sewage disposal system with a sealed vault to avoid local water contamination.	N	Y	Y	N	Y
	Settled sewage system or soak pit system	Toilet connected to an on-site septic tank and either a soak-away or sewer. Toilet flushed by cistern using little water.	Y	Y	N	N	Y
	Composting toilet or urine diverting dry toilet	The composting and urine diverting dry toilet operates by separating the liquid and solid wastes. Produces usable humus fertiliser after several months to one year.	Y	Y	N	N	N
	WC waterborne sewage	An off-site sewage reticulation system.	Y	Y	N	N	Y
<b>Street lighting and household electivity supply</b>	Street lights – below ground	Lamps and poles are provided along roads.	Y	N	N	N	Y
	Street lights – above ground	Lamps and poles are provided along roads.	Y	Y	N	N	Y
	Mast lights	Lamps and poles are provided along roads.	Y	Y	Y	N	Y
	Photovoltaic street lights	Solar energy is stored in a battery during the day and then used as electrical power for lighting at night.	Y	Y	N	N	Y

The following case study provides an example of how the above has been applied to water reticulation.

## **Example 2: Makause, Ekurhuleni installation of a water reticulation system**

The Makause informal settlement accommodates some 15 000 people and is located in Germiston in the Ekurhuleni Metropolitan Municipality. Prior to this project the Ekurhuleni Metro had only provided two taps in the settlement far away from the community, who also had five makeshift water connections. The project, initiated in 2011, was to install water reticulation infrastructure upgrading consisting of seven taps and to build four new taps with concrete slabs.

With support from two NGOs, ISN and FEDUP, the Makause informal settlement formed a community construction management team (CCMT) to oversee the project implementation and a savings scheme called Gardens of Hope. CORC provided technical support. The budget for the project was R24 900. This was covered by a contribution of R1 095 from the Garden of Hope savings scheme, R13 000 from the Mvula Trust and the balance of R10 800 from the Community Upgrading Financing Facility (CUFF).

In order to implement the project the community formed three teams, Team 1 to dig the trenches, Team 2 laying pipes and making connections and Team 3 to do the soak-aways and drainage systems. The project took six days to complete. The outcome resulted in the provision of taps, drainage and washing facilities to at least three sections of the settlement reaching more than half of the community of 5 000 people.

*This case study demonstrates what a solely community-driven project can achieve in service provision.*

## **How is layout and infrastructure funded?**

The key funding mechanisms for layout and infrastructure are:

- UISP: Provides funding for land acquisition, pre-planning, detailed town planning, land surveying, interim basic services and permanent engineering services.
- USDG: Provides funding principally for basic services (e.g. water supply, roads, sanitation, etc.) for metropolitan municipalities.
- IRDP: Provides funding for land acquisition, pre-planning, detailed town planning, land surveying, and infrastructure installation.
- MIG: Provides funding principally for basic services (e.g. water supply, roads, sanitation, etc.) for non-metropolitan municipalities and for bulk infrastructure.
- Emergency housing: Provides funding for basic infrastructure where emergency housing is being provided.
- Municipality: It is assumed that the municipality will need to cover the costs of the other initiatives if the above scenarios apply.



# Toolkit

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You will find the following resources on the Toolkit CD:

- Examples of Service Delivery Options
- Video: Mshini Wam Upgrading (CORC)
- Video: Ruimsig Reblocking (CORC)

## References and Resources

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### Reference material

- Abbot, J. (1996), 'Approaches to urban infrastructure provision: Experiences from South Africa', Habitat International
- Behrens R and Watson V (1996) Making Urban Places, University of Cape Town
- CSIR: Guidelines for Human Settlement Planning and Design Vol 1 & 2 (2000)
- Davidson, F & Payne G, (1983) Urban Projects Manual, Liverpool University Press

### Useful links

- South African SDI Alliance: <http://sasdialliance.org.za/>
- Video: Mshini Wam Re-blocking: <http://sasdialliance.org.za/video/>