



# PLANNING URBAN SETTLEMENTS IN SOUTH SUDAN

BASIC CONCEPTS

**UN**  **HABITAT**  
FOR A BETTER URBAN FUTURE

# **PLANNING URBAN SETTLEMENTS IN SOUTH SUDAN**

BASIC CONCEPTS



# Contents

<b>Foreword .....</b>	<b>v</b>	
<b>1. Introduction.....</b>	<b>1</b>	
Overview.....	1	
Problem statement .....	1	
Objectives of the manual.....	2	
Structure of the manual .....	2	
<b>2. Cities .....</b>	<b>3</b>	
<b>3. Urban Development .....</b>	<b>7</b>	
City growth in South Sudan .....	9	
<b>4. Urban Planning Interventions.....</b>	<b>10</b>	
Plans at different scales .....	10	
City-wide Plan .....	11	
Private and Public Land.....	12	
Land Use .....	12	
Density.....	14	
Compactness .....	14	
<b>5. Development and Upgrading of Existing Areas.....</b>	<b>16</b>	
Formal or planned areas .....	17	
Dynamics of transformation .....	18	
Infill development .....	19	
Informal or unplanned areas.....	20	
Solution for unplanned areas .....	21	
Upgrading plans .....	21	
<b>6. Planning New Development Areas.....</b>	<b>25</b>	
Design Criteria for New Development.....	26	
Grid/street layout .....	26	
Land use categories.....	27	
Residential areas.....	27	
Public open spaces: .....	28	
Mix use in residential areas.....	28	
Commercial areas.....	29	
Industrial areas .....	29	
Public services/utilities .....	30	
Reserved areas (including nature reserve).....	31	
Site analysis.....	32	
Plans and maps .....	33	
Site surveys .....	34	
Layout design.....	36	
Topography .....	36	
Land coverage.....	38	
Plot characteristics.....	40	
Plots set out .....	41	
Plot layout .....	42	
Plot size.....	43	
Plot pricing.....	43	

<b>7. Infrastructure .....</b>	<b>46</b>
Circulation .....	47
Streets hierarchy.....	47
Road reserve widths .....	48
Road width .....	49
Parking.....	50
Footpaths/pavements .....	50
Cycling paths .....	51
Drainage .....	52
Transport .....	52

<b>8. Services .....</b>	<b>53</b>
Water supply.....	54
Rainwater .....	54
Sanitation.....	55
Treatment of sewage .....	55
Community toilet facilities.....	56
Solid waste management .....	56
Electricity supply.....	57
Street lighting .....	57
<b>References .....</b>	<b>58</b>

## Foreword

Today, more people than ever live in urban areas. The United Nations puts the tipping point in 2007 when, for the first time, half of the world's population was living in urban areas. City dwellers need to be housed and provided with places to access livelihoods and recreation. One of the most important elements of organizing human settlements is spatial planning, the main purpose of which is to help achieve sustainable development.

People's lives and the places in which they live can be better if they are well planned, but they will certainly be worse if human settlements are left to grow spontaneously.

The natural and historic environment – landscapes, buildings, towns and villages – can be better cherished if land uses around them are properly planned.

In order to fulfil its purpose of helping achieve settlements that respect the natural topography, planning must not simply be about scrutiny. It must also be a creative exercise to find ways to enhance and improve the places in which people live.

The purpose of this manual is to assist planners, engineers and surveyors to design new neighbourhood layouts and to upgrade

existing ones. It sets out clearly what could make a proposed plan or development fit an existing neighbourhood and sets out guidelines for new development.

This document comes at an ideal time when South Sudan's urban professionals are eager to learn techniques to create places where people can live, work and play while ensuring the integrity of the environment.

I am thankful to the teams that developed this document and reserve special thanks to UN-Habitat, my senior staff in the Ministry of Housing and Physical Planning and the field staff from the various ministries concerned for their collaborative efforts in making this vital document a success.

**The Honourable Jemma Nunu Kumba**  
Ministry of Housing and Physical Planning,  
Republic of South Sudan.



Juba, South Sudan  
© Flickr/BBC World Service

# 1 Introduction

## Overview

Urbanization is not a modern phenomenon but has occurred since about 5000 B.C. Human settlements were usually born along rivers, where people had access to water and transport and were close to their sources of livelihood. These settlements grew and eventually became towns.

Today, more and more people in South Sudan are living in fast urbanizing areas. In South Sudan, for census purposes, only people who live in towns and cities (former regional and county capitals) are considered to be the urban population. At present, this represents approximately 22 per cent of the country's total population. Studies show that the rapid urbanization process observed in South Sudan has been determined by massive rural-urban migration due to prolonged conflict among tribes and to the liberation war. Since the signing of the Comprehensive Peace Agreement in 2005 and the subsequent independence of the South Sudan, streams of internally displaced people and returning exiles have flocked to urban centres in the new South Sudan.

The South Sudanese Ministry of Housing and Physical Planning (MHPP) has collaborated on the preparation of this manual,

which was developed after intensive fieldwork by UN-Habitat and Norwegian Capacity (NORCAP) in different states of South Sudan to get feedback from end users. The manual includes simplified illustrations targeting South Sudanese planners and land surveyors who are involved in settlement planning. The text and images included here are intended to stimulate the imagination, increase understanding of the planning process, and to serve as a guide for designing new urban layouts and upgrading existing ones.

## Problem statement

Until today, urban planning in South Sudan has consisted mainly of rudimentary subdivision layouts usually intended to demarcate plots to be allocated by local authorities. No rigour is applied in the process. As a result, existing field conditions are not taken into account and layouts are developed without any proper design of a city in which people want to live.

The lack of capacity of urban professionals (planners, municipal engineers, urban designers, architects, etc) and technical equipment has resulted in the uncontrolled growth of urban settlements, which is exacerbated by waves of returnees and refugees.

## Objectives of the manual

This manual provides orientations, concepts and general knowledge for adequate urban planning in South Sudan, from which a detailed step by step methodology can then be derived which matches the needs of each locality.

It provides urban professionals and planners with different points of view to be considered when designing a new layout or upgrading an existing one. It also includes concepts about spatial data collection, analysis and interpretation, and the formulation of proposals while preparing basic and/or urban plans.

To make towns physically attractive and accessible for their residents, and to facilitate the sustained development of towns, there should be a responsive and up-to-date urban plan. Land use planning should take into account historical, physical, environmental, social, demographic and economic aspects that characterize the area under study.

## Structure of the manual

This manual is organized into seven sections: (i) brief history of cities; (ii) urban development; (iii) urban planning intervention, including plans at different scales, city-wide plans, and a look at private and public lands; (iv) development and upgrading of existing areas, including formal or planned areas and informal or unplanned areas; (v) planning new development areas, including criteria for selecting areas that require a planning exercise, street grid layout for different land uses and layout design; (vi) a brief introduction to infrastructure, including circulation, drainage and transport; and, finally, (vii) services, including water, sanitation, sewage treatment and solid waste management.

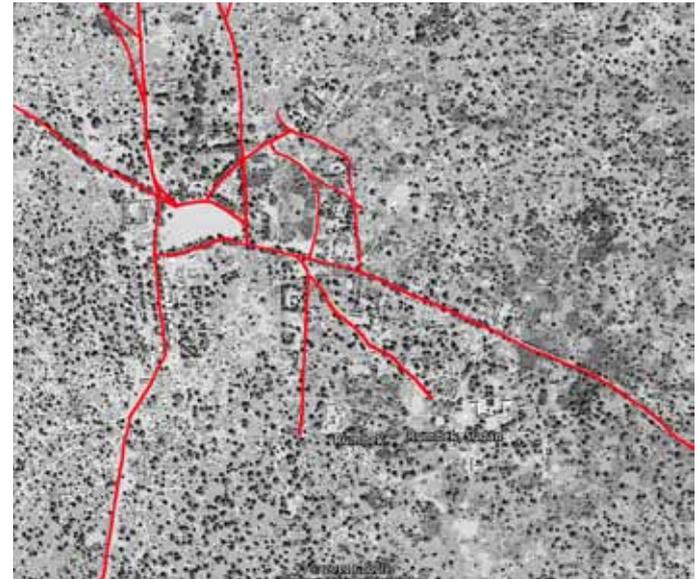
## 2 Cities

Human settlements were mostly born on river banks, where people had access to water, transport and were close to livelihood opportunities such as fishing, hunting and planting. As roads

became the main means of transport, human settlements began to develop at crossroads or along the main roads, becoming important trading centres.



Malakal County developed along the Nile River © Google, 2011.



Rumbek County at an important crossroad © Google, 2011.



**Aerial view of existing ruins of Mohenjo-Daro, Pakistan.**

Settlements grew and were transformed into towns where a variety of activities co-existed, production, trade, education, religious, leisure and many other activities took place at the same time in the same place. This created the need to organize

the land and administer its development. This meant delivery of road, water, energy and other important infrastructures for all urban residents in an efficient and cost-effective manner, to allow a larger number of people to benefit from those urban services.

Towns can easily become out of control unless their expansion is planned well in advance. This is the main responsibility of planners or town authorities in charge of planning. Their most important role is to foresee what the demand for land and infrastructure will be in the future in order to direct its development.

Planning urban development should aim for privacy in residential areas, the easy flow of traffic and the establishment of enough public spaces for schools, hospitals, open areas, parks and playgrounds, among other community facilities.

One of the most ancient cities in the world is Mohenjo-Daro in Pakistan. It was built along the River Indus by people of the Indus Valley Culture 5000 years ago, and was planned according to the best urban standards of the time.

Its layout was appropriate to the geographic and climatic conditions of the area. It had differentiated land use areas; principal and secondary roads, footpaths and public spaces, an elaborate drainage system and many other developments that can still be observed.



Cities are constantly growing and presenting all kinds of opportunities for their ever-increasing human population. Contributing to this growth is a constant human migration from rural areas and the escalating number of people who are displaced because of human conflict or natural disasters. In short, cities will grow with or without planning.

Towns/cities are the engines of national and regional development. They are centres of government at national, state and county levels and they are the principal source of economic services: markets, trade and commerce, banking, insurance and credit, communications and technical support.

Towns/cities are also the centres of national and regional social infrastructure: hospitals and other health referral facilities, secondary and higher education, and technical/ vocational training. They are the source of cultural change, modernization and social development.

- 
1. Streets in the city centre of Mohenjo-Daro, Pakistan.
  2. Open drain in secondary street. Mohenjo-Daro, Pakistan.
  3. Drain covered with lime stone that absorbs odours and humidity in one of the principal streets. Mohenjo-Daro, Pakistan.



Juba city centre, 2011.

## 3 Urban Development

**Urban development** is principally driven by three elements (drivers): economic activity, administration/government, and population.

**1. Economic activity.** The local economy distributes goods (in markets, shops, etc), provides manufacturing and service industries (factories, workshops, construction and building, hotels, etc), provides financial services (banking, insurance, etc) and creates jobs.

**2. Administration/government** is the largest formal employment sector and is the major developer engaged in the construction of infrastructure: roads, public utilities, government offices, public housing, schools, hospitals, clinics, public spaces, green areas, etc.

**3. Population.** The residential population generates the demand for residential land, which is the largest single land use in any town. The growth in population is the main determinant of the speed and size of urban expansion.



Juba city centre, 2011.



Commercial activities in the streets of Juba, 2011.



Juba, South Sudan, 2011.

These three drivers collectively generate demand for a multitude of urban services, which, in simple terms, are summarized as land and infrastructure.

**Land** – plots or sites on which activities are carried out: houses, markets, shops, offices, government buildings, schools, health facilities, workshops, etc.

**Infrastructure** – roads, water distribution, sanitation, electricity, telecommunications and other structures that enable activities to function effectively.



Urban development in Juba, 2011.

## City growth in South Sudan

Cities/towns in South Sudan are growing quickly. The population increase in cities/towns is attributed to: natural growth (people born in the cities/towns), rural-urban migration (people moving to the city from rural areas for various reasons), and returnees who are coming back after being displaced (most of whom go to cities and settle there).

A growing population means there is also need to accommodate more activities and services.

The city of Juba has grown in size approximately five times in the past ten years. This growth has happened without any proper layout or planning and has led to the development of informal areas (or spontaneous settlements).

In general, authorities have not been able to keep pace with new arrivals and services have not been extended. The need for new plots and the pressure to deliver them quickly is enormous. Without proper understanding of good plot and settlement design, however, cities/towns in South Sudan will grow in an inefficient way, resulting in a waste of many resources.



**CITY GROWTH OF JUBA** 12.000 km<sup>2</sup> in 2003 to 64.000 km<sup>2</sup> in 2012.

## 4 Urban Planning Interventions

### Plans at different scales

Planning in advance means guiding growth towards the most suitable areas where services or access to job opportunities could be provided. This will then avoid the most serious problems of spontaneous growth. To properly plan a city or settlement, planners need to work at different scales.

**Regional planning** mainly serves to identify which cities will grow more and so need more investment; which services are available or need to be provided in some centres; and which are the most important roads and connections that need to be constructed.

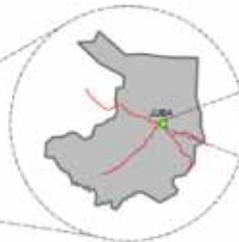
**A district plan** will help to organize and define how the city will relate to the agricultural hinterland, how access and links with markets can be reinforced and which natural resources it is important to protect for the city and its residents.

**City-wide plans** guide the city's future development. A city plan should include land use and strategic urban projects, and should also guide the development activities in the city.

**Settlement plans** focus on one neighborhood or part of it. They provide a detailed layout of private and public spaces, plot delimitations and the overall regulations for development and building. They also make provision for services and infrastructure. Different plans respond



National Spatial Framework (1:1.000.000)  
- Economic zones, main infrastructure, corridor, urban system.



District Plan (1:50.000)  
- Agglomeration, economic zones, infrastructure.



City-Wide Plan (1:5.000)  
- Land use, expansion, transformation areas, etc.



Settlement or Layout Plan (1:2.000)  
- Neighbourhoods, public spaces, plots.

to different types of decisions and it is important to understand the plans before starting development activities.

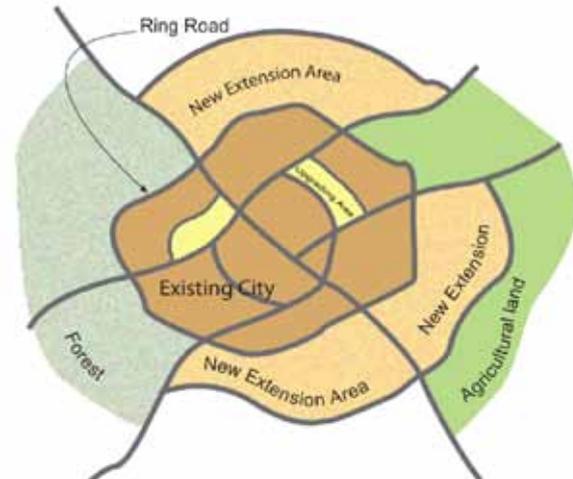
## CITY-WIDE PLAN

A city-wide plan can be very complex, therefore a basic plan that shows the different land uses for each area may be sufficient to help guide the growth of a city.

A simple city-wide plan (that can be drawn on an A3 paper), should identify the following:

- **City boundaries and extension areas, for future development of the city.** A city-wide plan should define the city boundaries, including the boundaries of land required for future expansion, to the level of the expected scale and distribution of future growth. The chosen planning time-frame should not be too long-term as this could have a negative impact on rural communities adjacent to the city. A planning horizon of 10-15 years is adequate. The city boundary can be formally reviewed at any time to make adjustments to meet unforeseen land needs.
- **Areas (slums) for improvement and upgrading.** Area/slum upgrading is more sustainable if it is planned on a city-wide level. This means making a quick analysis of the slum situation by mapping all the locations in the city, identifying their most pressing needs and setting priorities to tackle the challenges.

- **Areas for protection (to be maintained as open, green and natural areas).** Land that is not geographically suitable for development, such as swamps, flood plains, water courses or other environmentally sensitive areas (ESA) and risky and inaccessible areas, should be reserved. These can be converted into green areas that will enrich the quality of a growing city's environment.
- **Main infrastructure.** The city-wide plan should also identify existing key infrastructure and those to be developed. This will ensure access to communication and basic services.



## Private and Public Land

The first differentiation of the urban land use concept is to identify private and public lands.

**Private land**, for residential and commercial use (housing, markets, shops and factories), and

**Public land**, to use for streets and public spaces (government offices, schools, hospitals, green areas, etc).



When developing land, this sub-division of urban land is important. It determines the efficient long-term land use in a settlement and the right amount of land that should be delivered for each, private and public use. A 50 per cent proportion for each use is considered acceptable. Risky areas are not considered to be areas for development and are therefore not considered for this percentage.

When considering public land for development, care should be taken in deciding which areas need to be preserved and which need to be expanded.

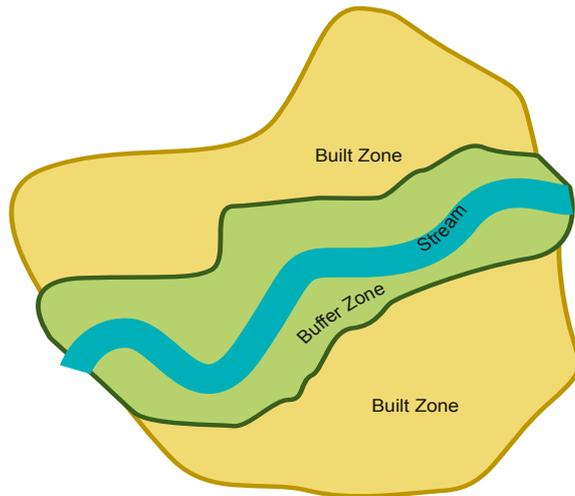
Public spaces should ideally be no more than 20 per cent of the total project area. An additional 30% should be used for streets, off-street parking places and footpaths.

Land Use	Kind	%	Total
Private	All	50	50%
	Spaces	20	50%
Public	Roads and footpaths	30	

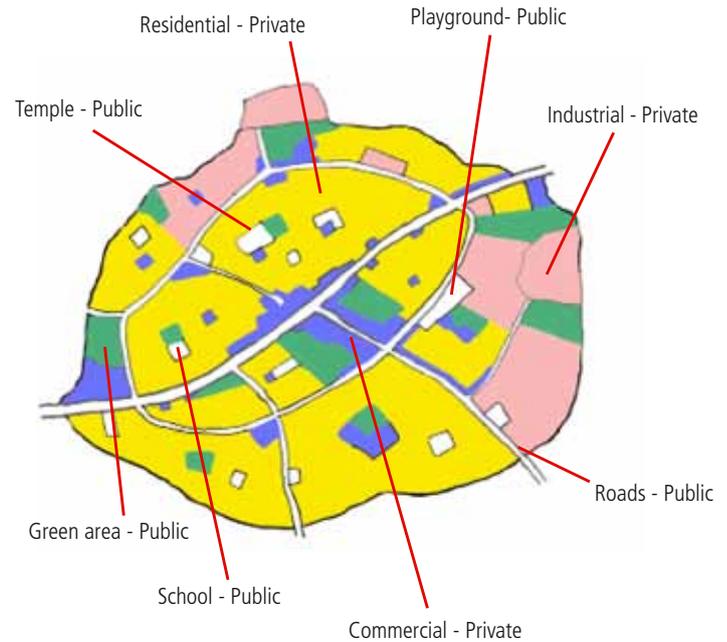
In neighbourhoods, the main need for public land will be for a primary school, local shops and religious buildings. For larger areas, clinics, secondary schools and other urban facilities will also be needed, therefore, the proportion of public spaces should increase relative to space.

## LAND USE

Just as the different spaces of a house are allocated for specific uses – for example bedrooms for sleeping, kitchens for cooking, washrooms for sanitation, living areas for leisure and the rest for access and movement - so too should city spaces correspond to the various activities that are developed in the city.



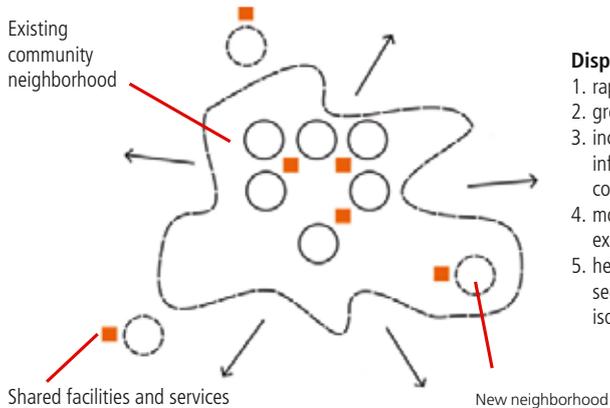
Incompatible uses should not be placed in one location, to maintain the integrity of each use. Buffers should be created between zones of incompatible uses or between residential areas and risky areas prone to natural disasters. The above characterization of private or public use should be made for every land use zone.



## DENSITY

Density in an urban context means more or less numbers of people served by urbanization in a certain area. The higher the density, the more efficient the layout will be, because more people will be served by the same length of public service lines. This reduces the construction cost of physical infrastructure such as road, electricity, telephone, water and sewerage systems. A higher density allows more people to live closer to public spaces, schools, hospitals, places of worship and community facilities.

This will ensure better transit conditions over time, shorten trip distances, save travel time and preserve millions of square kilometres of arable land.

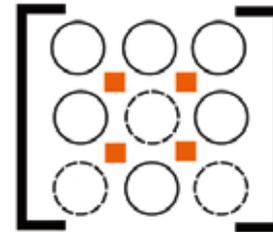


### Dispersed City

1. rapid urban expansion
2. great land consumption
3. increase of services and infrastructure provision cost
4. more difficult and expensive administration
5. heightening of social segregation and isolation

## COMPACTNESS

New development placed far from the existing cities is inconvenient and rarely thrives. City planners can avoid this by locating compact new sub-centres within or adjacent to existing cities. Most cities have land that is no longer needed for its original purpose. Cities need to create incentives to develop such land first, before driving development to distant green fields. In addition to protecting arable land, this strategy significantly decreases the cost of providing transit utilities and other services to new locations, while reducing most residents' daily commute.



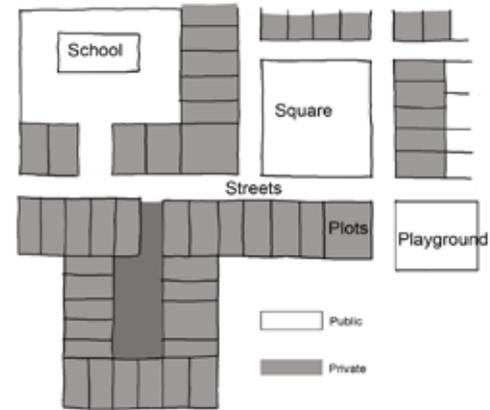
### Compact City

1. filling the vacant and under-used land within the town limits
2. limited consumption of land
3. writing off and sharing facilities and services
4. easier and more cost-effective administration



Neglected public space destined for footpaths in central streets of Juba.

The most important factors in an efficient layout are the proportion of public and private areas and the cost of installing public utilities, which depend mainly on compactness.



With these principles in mind, the key planning interventions to organize urban areas are:

- **Upgrading of existing areas** and
- **Layout of new settlements**

These require a good understanding of land and infrastructure, as will be discussed later.

## 5

## Development and Upgrading of Existing Areas

Much of the development work required in main towns involves what is termed settlement upgrading.

The upgrading of an existing area refers to the improvement of conditions, facilities and services for the benefit of local households. The aggregate effect of upgrading settlement areas such as slums makes an important contribution to the overall improvement of the whole town/city.

Three basic rules should apply to the upgrading process:

**Minimise displacement:** The aim of upgrading a settlement is to protect the rights of residents and improve their living conditions. The priority should always be to keep the settlement in the existing location, because displacement involves a variety of unexpected negative social and economic effects that are difficult to control. An in-situ upgrading plan is needed. Due to environmental and other poor conditions it might be necessary to relocate either part of or the whole settlement. But this should be the last option. If the settlement has to be removed, alternative plots for displaced residents need to be provided.

**Community participation:** The community needs to be fully involved in the upgrading implementation to ensure that proposals are affordable and accurately reflect people's needs and aspirations.

**Incremental delivery of infrastructure & services:** An upgrading package for an area will typically feature a mix of components to improve physical conditions of the area such as water supply, sanitation and roads.

Plan for the incremental improvement of infrastructure and services over time. It will not be possible to provide a high standard of service from the start due to budget and household affordability constraints.

Formal (planned areas) and informal (unplanned areas) are the two types of settlement traditionally covered by upgrading, both with degraded or unimproved services.

## Formal or planned areas

In formal areas, the main focus is on improving the infrastructure and regularizing the existing development layout.

Typically, in existing third or fourth class areas, plots have been developed in accordance with an approved layout and will have some security of land tenure, but they will display some or all of the following characteristics:

- Unsurfaced roads/footpaths in a degraded condition;
- Seriously degraded or no public utilities (water supply, sanitation, electricity, etc);
- Overcrowded living conditions resulting from plot sub- division;
- Encroachment of plot development onto road/footpath reserves and open space; and
- Shortage of local community facilities, e.g. schools, clinics, etc.

Development in planned areas may not be strictly in accordance with the original plan, or as per the plot demarcations set out by the surveyors. In many cases this will not matter because minor variations that do not cause major obstruction or inconvenience to

public space in adjacent blocks tend to be ignored and accepted by the local community.

If parcels are too small with, too many access roads, some of them can be eliminated and converted into open spaces, playgrounds and footpaths, private plots or other productive use.



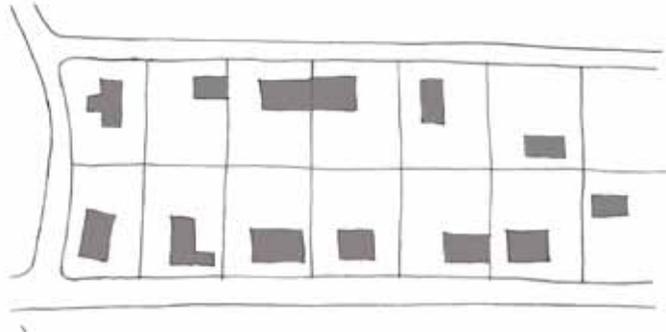
**Formal areas that need upgrading, outskirts of Juba**

© Google, January 2011.

## DYNAMICS OF TRANSFORMATION

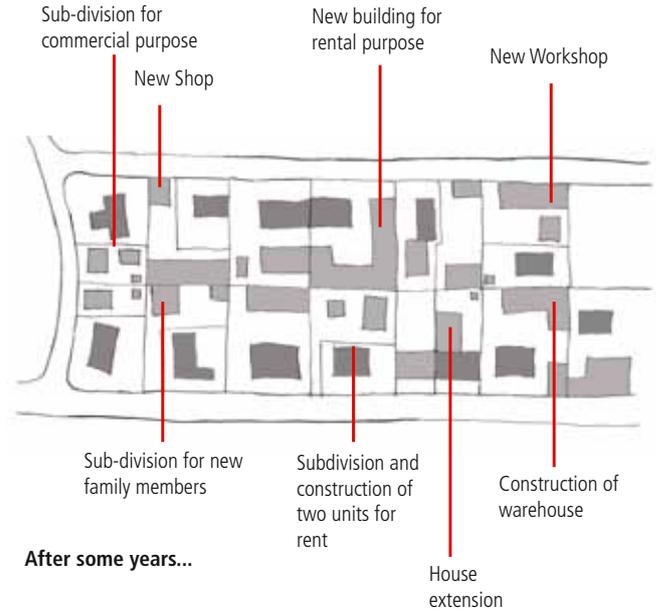
When plot dimensions allow it, low-income, formal, planned areas experience informal transformation that generally densifies the neighborhood with mixed use.

The above pictures illustrate typical plot sub-division in formal areas, before and after several years.



Original planned area

This process is part of the spontaneous development of urban areas that creates demand for more services, infrastructure and street space. Upgrading will often need to be done to provide such services.



After some years...

## INFILL DEVELOPMENT

The term infill development describes the development of unused or under-used land within the existing town/neighborhood structure. This may involve re-drawing the boundary of large under-used plots to create a new block of “vacant” land on which additional plots can be set out.

Inefficient use of land contributes to the high cost of infrastructure development. The need to promote cost-effective development means that such land should be put to productive use.



Infill development in the Center of Juba.



Example of typical underused areas that can be used in infill development.

## Informal or unplanned areas

Informal or unplanned areas are settlements within the town/neighborhood structure that have grown spontaneously through the actions of a community or individuals, and are outside the statutory planning system.

Residents of informal areas may be migrants and internally-displaced people, but may also be long-term residents of the city from lower income groups.

People who are unable to get formal housing plots, mainly due to a lack of adequate plot provision, usually take their own initiative.

### **SOLUTION FOR UNPLANNED AREAS**

The first issue to be addressed in such cases is whether the settlement can stay and be upgraded or should be relocated.

Settlements should not be displaced simply because they are informal or unplanned. There must be other factors to justify displacing people who are usually among the poorest and most disadvantaged urban settlers. Even if people are squatters, the settlement should remain in place unless there is a pressing reason for its removal (e.g. it is vulnerable to flooding or sand storms, there is no access to water, it is close to environmental hazards, the site is required for a hospital/school, main road etc).



**Informal settlement of Hai Sandya, centre of Juba**

© Google, February 2011.

This leads to two alternative courses of action:

- If the settlement is to remain, households are given security of tenure and an upgrading plan should be prepared.
- If the settlement is to be removed, alternative plots must be provided to relocate the displaced households. The alternative site should either be close to the old site or one with improved and acceptable living conditions.

### UPGRADING PLANS

Successful upgrading of informal settlements must give special attention to:

- a. **Land tenure:** Because these are informal settlements, residents will usually have no formal land tenure; providing security of tenure is central to the success of upgrading an informal settlement. and is also a major incentive for householders to improve dwellings.
- b. **Community participation:** The community should be involved in the entire planning and implementation process.
- c. **Community Sensitivity:** Efforts must be made to carefully consider issues of cultural and ethnic importance (religious shrines, burial sites, etc) in the community before effecting a

neighbourhood upgrade. Where new structures such as roads are needed, the interpretation should be that “the road fell on the turkul (house)” not “the turkul (house) fell on the road”.

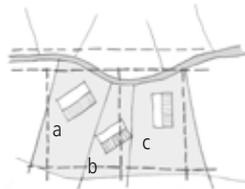
- d. **Regularisation of layout:** Informal areas usually have a very irregular pattern of plot development, which makes it costly to provide services to homes. This pattern often complicates the layout regularisation exercise, which should aim at a pattern of development that suits the local community. This allows the insertion of sufficient road space and essential services, however, it need not try to convert an irregular pattern into a regular grid.



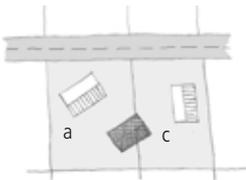
**Example:** regularization of an existing layout with the fewest possible demolitions.



1. Existing situation



2. New Layout  
considering relocation  
of Plot b



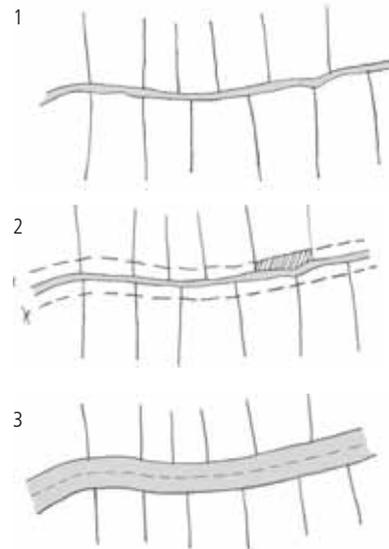
3. Removal of Plot b



4. New situation

**Example:** layout regularization where a house had to be demolished and the family relocated.

Expropriations and demolitions are often unavoidable in upgrading plans because space is required for roads, public utilities and public spaces. If any existing settlement is to be removed, alternative plots must first be provided to relocate displaced households. This relocation should be done either close to the site or to another appropriate site that improves the living conditions of the inhabitants and is acceptable to them.



**Example:** Partial expropriation of plots in order to widen an existing footpath into an access road.



1. Existing situation



2. Selected site for upgrading and identification of risk area



3. New streets proposal



4. New situation

**Example:** A site is identified for upgrading and a new street proposal is designed to improve and organize the layout.

## 6 Planning New Development Areas

The aim of expansion areas is to meet the increase in demand for plots that currently exists as well as the projected increase. Ideally, if there is an adequate master plan for the city/town, expansion areas should be planned in accordance with it. If there is no suitable plan, expansion areas should be selected on the basis of four simple criteria:

**1. Links to town:** The area selected should be contiguous or close to the existing town structures, especially infrastructure and services networks.

**2. Drainage:** The area should be free from the risk of seasonal flooding and ideally have a gentle slope that facilitates the removal of surface rainwater by natural drainage.

**3. Land tenure:** The area should be free of any contentious land issues with current occupiers. This may be achieved through selecting appropriate unbuilt land, which is free of conflicts; the tenure arrangements of the land should be clarified before planning any interventions. This includes consultations with landowners, land users, and land administrators (including statutory and customary).

**4. Environmental factors:** New development should avoid valuable agricultural or pastureland, established woodland, important watercourses, and areas of local ecological and cultural significance (e.g. customary burial sites).



Expansion areas in the city border of Malakal.

## Design criteria for new development

New developments should be designed to follow the criteria set out earlier:

- Define public and private space, as well as the street grid. Useful proportions are: 50 per cent of space for residence, 30 per cent for streets and 20 per cent for public spaces and services.
- Street grid is the key to structuring a developing area.
- Different uses: a new development needs to accommodate not only residences, but also services and economic structures. Flexible uses increase local economies.
- Compactness: In addition to protecting arable land, compact settlements reduce the cost of providing transit utilities and other services to new locations, while reducing most residents' daily commute.

## Grid/street layout

The street layout is the key structure of the new development. It ensures the ease of movement and accessibility, as well as safety within the area.

At the planning stage, it is important to consider the roads hierarchy according to their importance, which will result in safer traffic circulation and will also improve the quality of life in residential areas.

The topography of the site will be a deciding factor in the proper direction, hierarchy and layout of the roads planned; creating a grid that will structure the basic plan of the area.

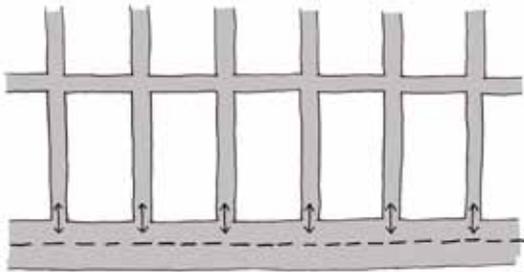
It is important to identify and categorize the existing roads and their function, condition and importance to the city; this will create a better connection between the existing settlement and the new development area.

## Land use categories

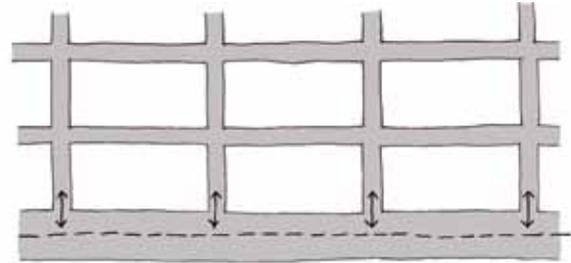
There are five basic zoning categories of land use in an urban area that can be identified through a planning exercise. These are: (i) residential, (ii) commercial, (iii) industrial, (iv) open spaces and reserves, and (v) public services/utilities.

### RESIDENTIAL AREAS

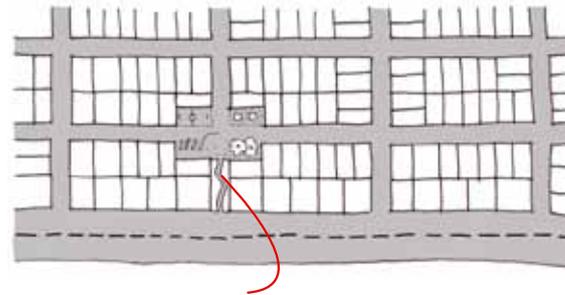
Road ways in residential areas: residential areas need privacy and safety, therefore they should have limited numbers of access roads, arterial/major roads or highways to prevent interference with traffic flow on major roads and to minimize the occurrence of accidents.



Too many access streets connected with the main road creates many possible accident points.



When parcels of land have been planned parallel to the main streets, there should be fewer access streets connecting to the main road.



In the image above, one of the access streets has been transformed into a footpath connecting an interior open space with the main road, eliminating one possible junction.

### **PUBLIC OPEN SPACES:**

Urban development should consider pockets of space for community use such as playgrounds, squares for commercial activities like public markets, recreation parks, green corridors, and riparian protection zones. These spaces have an important role in the improvement of the quality of life. They reduce air, sound and visual pollution, protect the soil and the natural water cycle and avoid excessive impermeability of the ground. Overall, they enrich the city and help to create a sense of belonging in a community.



Market square in Malakal.

### **MIX USE IN RESIDENTIAL AREAS**

The option of permitting some residential plots to be used for small industry or small-scale businesses should be considered, because overheads are reduced and full advantage can be taken of informal family employment. This is perhaps the most effective way to encourage local business. Special provisions should also be made for workshop areas that produce noisy uses such as panel beating, carpentry, etc (such as ensuring that these uses are located within a building that will attenuate the noise).



Mixed activities in Yei city centre.

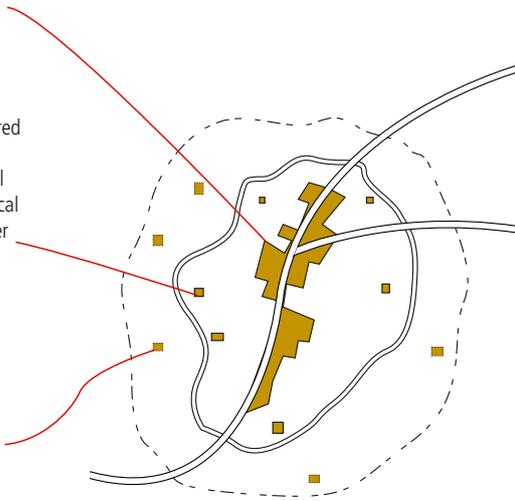
## COMMERCIAL AREAS

Commercial activities provide local employment and developing potential. Plot sizes, shapes and layout around their core should be designed so that commercial use can expand efficiently into these areas as the population and demand increase.

Commercial use has usually been considered along the main streets or concentrated in the middle of the town.

It should be considered also in the core of every new residential layout to increase local economical and other activities.

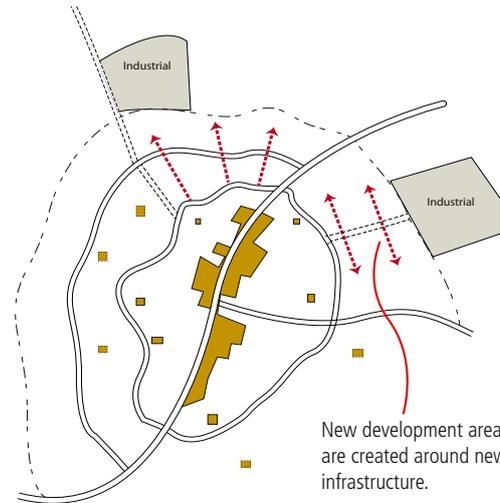
The provision of commercial "cores" can provide flexibility for future development.



## INDUSTRIAL AREAS

Industrial activity should be in peripheral parts of the town as it may produce disagreeable odours or noise or other kinds of pollution. Care should be taken to choose places where the wind ensures these odours drift out of town.

New industrial activities have the financial capacity to extend the city's infrastructure. Thus, new development areas tend to attract urban growth around them. This will in turn require the provision of access roads, water and energy for future urban development.



New development areas are created around new infrastructure.

The same idea is applicable to any other public or private services installation, such as water or waste treatment plants and electricity transfer stations. Although they are usually rejected by local residents, these installations can be harmless and bring investment to the area that provides economic opportunities to local people.

Obsolete industrial installations or those that were incompatible with the natural growth of the city, should not be demolished as they still represent an investment and can be used for many public or private purposes such as community or cultural centres and museums, depending on their location.

### **PUBLIC SERVICES/UTILITIES**

Schools, hospitals, public buildings including administration buildings, community facilities including recreation facilities, green areas, temples, playgrounds and utilities (road, water, electricity, sanitary, etc) solid waste management services and telecommunication services, are considered to be public services and should be available for everybody living in an urban area.

They should be placed close to a main road, fully accessible to the neighbourhood without crossing any major road because access to the services may interfere with the flow of traffic.

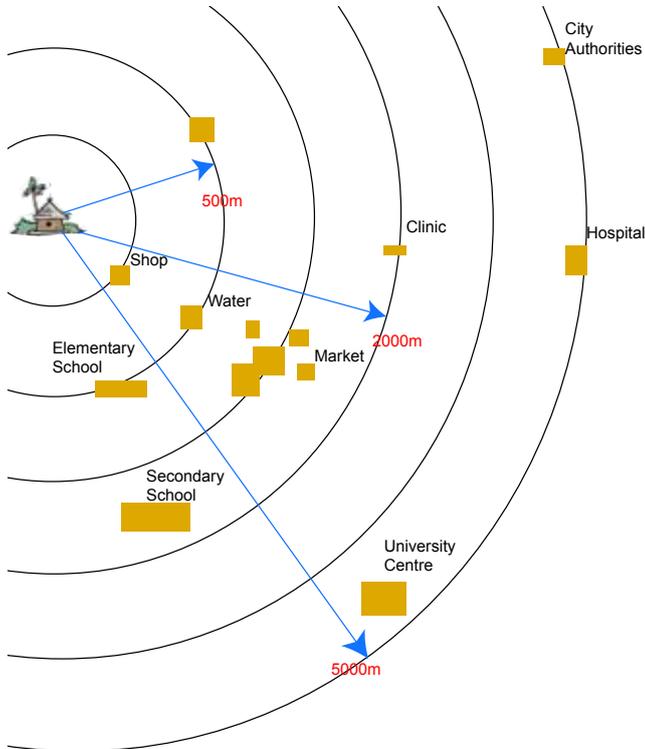
Public services should be placed in a safe geographical location, so that the neighbourhood can use those installations as a primary

refuge in case of a natural disaster, such as flooding, or torrential rain.

The most important item in site development will probably be provision of school sites, because schools generate the greatest land demand. Primary schools should be near the centres of the neighbourhoods they serve.



**School at Hai Zandia, Juba, 2011** © UN-Habitat.



## RESERVED AREAS (INCLUDING NATURE RESERVE)

Reserve areas are those reserved for future infrastructure development and other needs, such as heritage conservation and existing wildlife tracks. Areas prone to risk, such as gullies, watercourses and steep hills, which are not suitable for building, are considered to be public places and can be used as green areas, creating lungs for the city.

Tree plantations should be encouraged there to prevent erosion and avalanches. These areas can also be used for different leisure activities providing they are designed to resist any possible threats.

These areas should have a buffer around them to protect them from different land uses. Reserved areas should also be created for unforeseen needs such as new commercial activities or community facilities. Where possible, reserves could also be created for future road, railways and high tension electricity lines.

**Services have different catchment distances according to the type of service, the need for the service, and the size of the population served** © UN-Habitat, 2010.



## Site analysis

The design of any neighbourhood begins with a study of the proposed site and its natural processes. Understanding the site, its location and the natural system and environmental relationships is fundamental to any prospective development project.

The steps to be taken in site evaluation include:

### 1. Base line information gathering

- Natural (land-geology, soils, landforms, ridgelines, slopes, scenic values; water-surface and groundwater, wetlands delineation; vegetation-types and conditions, tree stands; wildlife habitats and endangered species; macro and micro climates, air quality, noise factors).
- Human made (buildings: existing structures, foundations etc; transport: road networks, transit systems bicycle lines etc; other infrastructure: sanitation, water supply, schools and other utility easements).
- Cultural (social influence: neighbouring uses, historic and archeological values, community attitudes; political and legal constraints: jurisdiction issues, master plan requirements, zoning and subdivision regulations, location of easements, environmental regulations).
- Economic (land values, taxation, neighbourhood growth potential, off-site improvement).

## 2. Contextual evaluation

- Regional context (growth management policies, infrastructure provision, housing policies and geography).
- Community context (public facilities and services, development pattern, local controls and regulations).
- Site context (natural features and environmental characteristics).

Several tools can be used to achieve proper site analysis.

## PLANS AND MAPS

Many plans and maps will have to be produced, each for a different thematic purpose. Satellite images, aerial photography (orthophotography) and other new technologies can help us to analyse and understand the different aspects of a geographical area. The latest images should be used because things change rapidly with time.

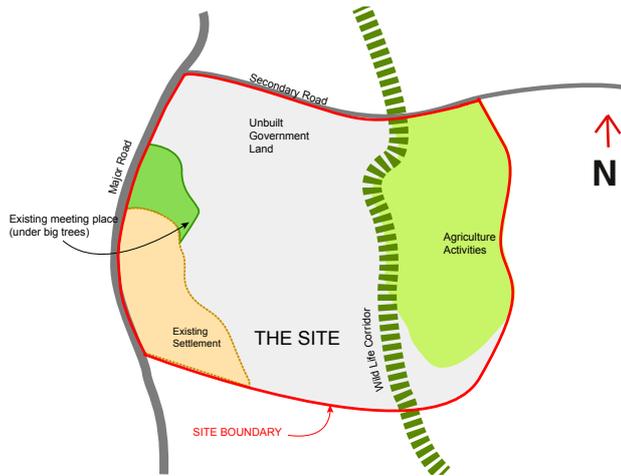


Aerial photographs taken with different kinds of cameras © UN-Habitat, 2000.

## SITE SURVEYS

In addition to aerial images and other existing information it is necessary to carry out site surveys in the field.

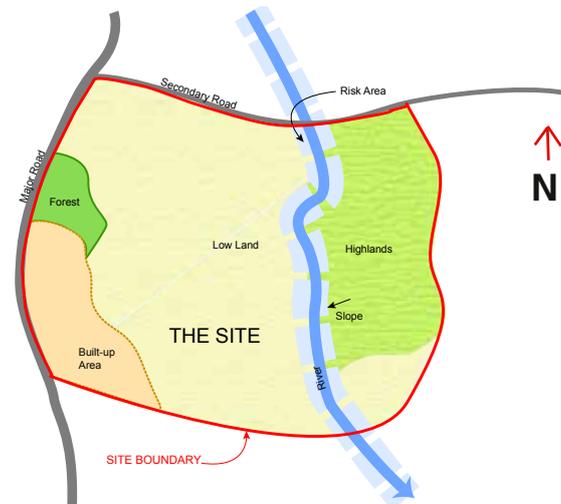
A series of sketches made on site are good examples of how observations can help us analyse the site location, and give us directions for the planning process. Site boundaries have to identify existing land tenure, ground conditions and other features, such as existing buildings and infrastructure.



Land tenure and site boundaries maps produced for a new site location.

Ground conditions should be investigated using trial pits to determine the soil quality and to establish whether rocks, ground water or aggressive chemicals or minerals are present. Existing natural features, such as trees, rocks and gullies, should be noted on the site plan. Any parts of the site likely to present problems should also be clearly marked.

Unsuitable areas for buildings should be identified and appropriate sites selected for public utilities and spaces.



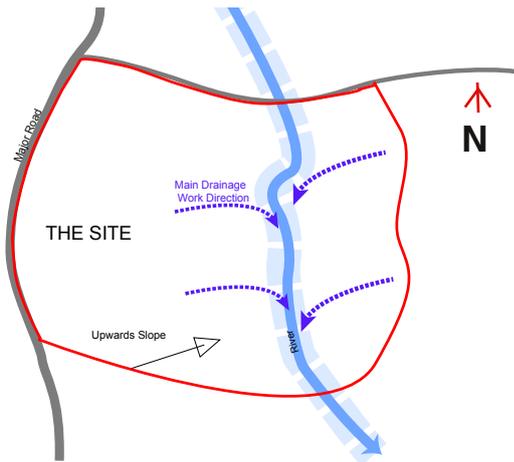
Ground conditions and topography.

The main drainage works and the desirable connection to the adjacent areas need to be identified. It may be appropriate to increase or reduce links, depending on the expected land use of given area.

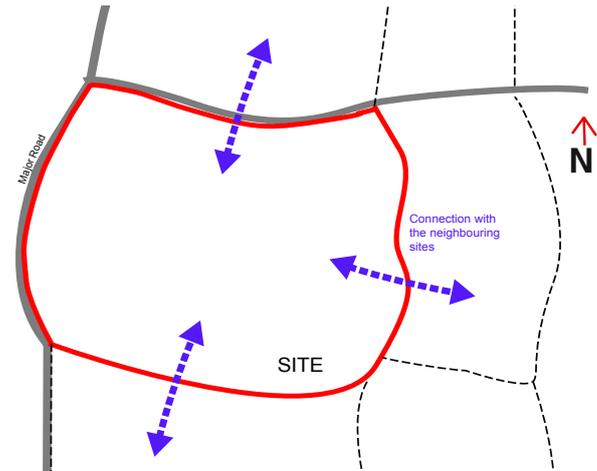
Noting the site orientation and the sun's movements will lead to an understanding of shade and sunscreen needs for the layout of streets. In the tropics, the main road should be developed along the east-west axis.

The main road orientation should also follow the prevailing wind direction to assure natural ventilation and dust removal for all buildings along the road. When there is conflict between the wind direction and the sun's path, caution should be taken.

Details of areas adjacent to the development project sites should also be noted on the site map. Utility networks, such as drainage and waste disposal, should be carefully planned so they do not affect development proposals in adjacent areas.



Main drainage works direction.

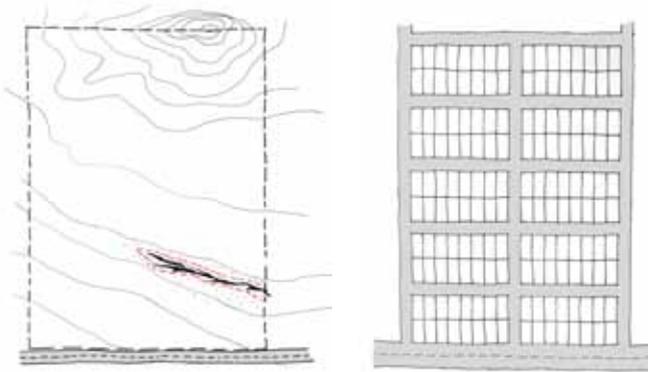


Connection to adjacent areas.

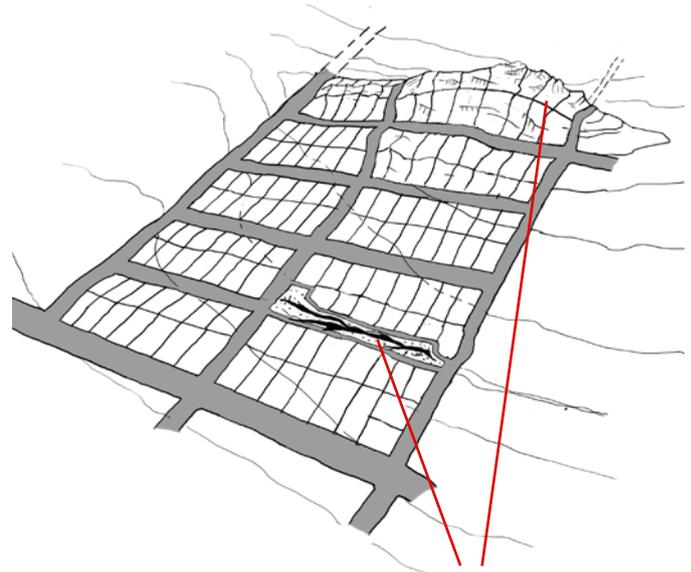
## Layout design

### TOPOGRAPHY

Once all the information has been analysed, care should be taken to create layouts that are appropriate for local social and cultural practices, and especially for physical conditions. Topography should be carefully observed when planning a layout.



If physical conditions are not observed, the following can happen:

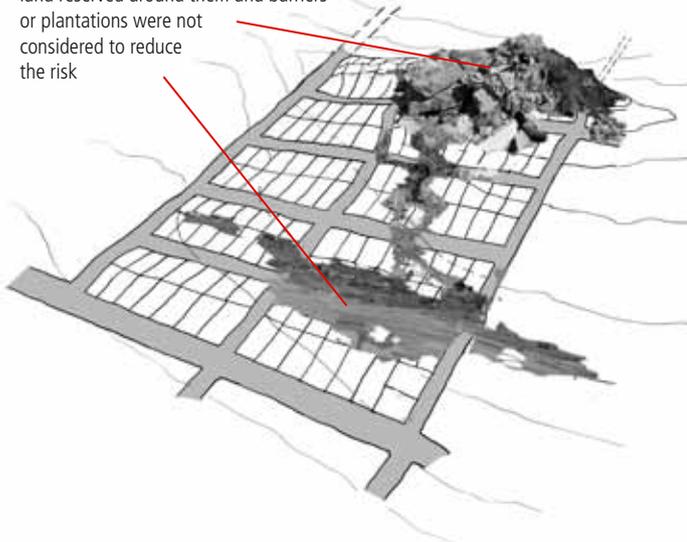


Unsuitable areas for development are distributed.

Building on steep rocky areas is impossible or too expensive, resulting in plots being abandoned and used for accumulating waste. There should be no developing of an area that nobody maintains or cares about.

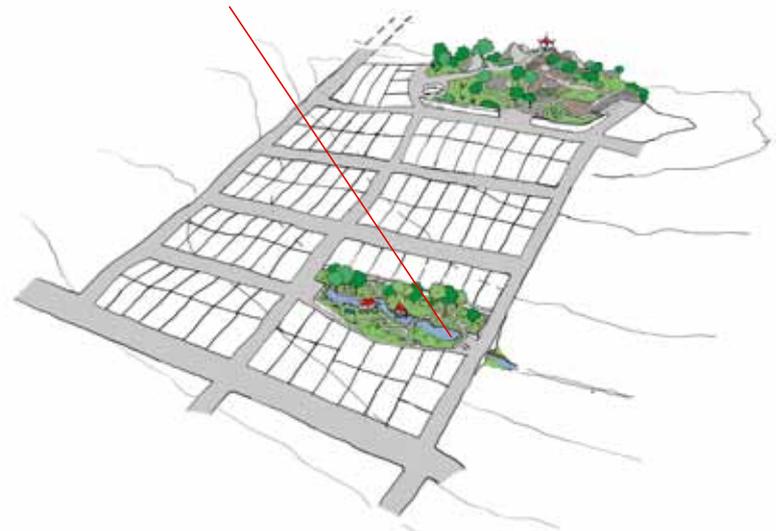
Where no trees are planted, there is a high potential for an accelerated run-off that causes erosion. Rainwater, earth, stones and accumulated waste flow downhill contaminating the whole area.

In low areas around existing watercourses, plots are flooded and badly affected by seasonal rains if there is not enough land reserved around them and barriers or plantations were not considered to reduce the risk



When the layout is respectful of the existing physical conditions, steep and low areas are protected and used as green areas for leisure purposes, creating many economical activities in the future neighbourhood.

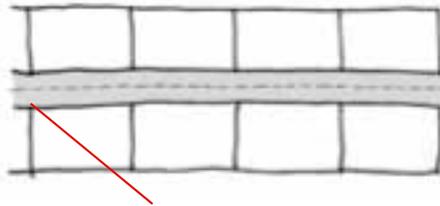
An appropriate urban design takes into consideration the solar and wind orientation to locate roads, public spaces and buildings, in order to optimize energy use and microclimate conditions; the watercourse is channelled and all installations in the area are planned to resist inundations in low areas.



## LAND COVERAGE

The supply of good, urban, development land is not infinite. It is therefore imperative to plan urban development to use land as efficiently and effectively as possible. There are a number of simple, well-established techniques to reduce land consumption:

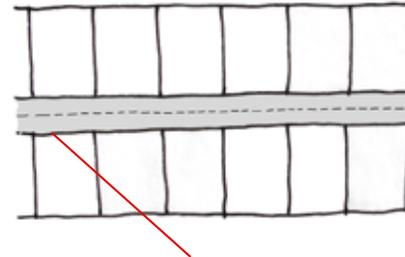
**Small plots:** The smaller the plot, the more households or activities that can be accommodated in a given area, with less cost for services and infrastructure provision.



Wide frontage plots maximize circulation/utilities lengths.

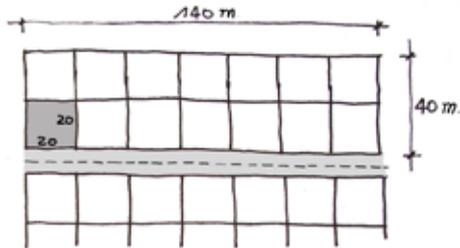
**Rectangular plots:** Those for which the frontage is the shortest side are much more cost-effective because utilities run along the short side and a given length of pipe will serve more plots. This considerably reduces the number of roads needed to access the plots.

Each metre of road, drain, water pipe and electricity cable costs money. It is therefore important to plan layouts in a manner that allows the shortest length of network to serve the largest number of plots. This will help reduce the total cost of the project and therefore the costs to each household.

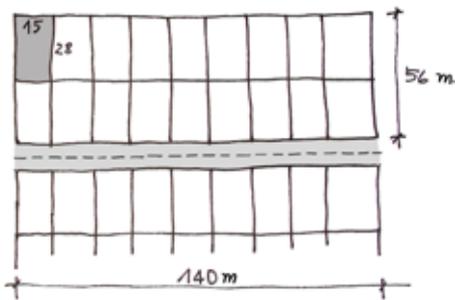


Narrow frontage plots minimize circulation/utilities length, therefore, reducing the maintenance cost.

**Advantages of rectangular plots:** If authorities have agreed to provide plots of 20 x 20 m, for example, it means 400 m<sup>2</sup> for each plot. The same area can be designed in rectangular plots, which will improve the efficiency of the layout.



In this case, a road of 140 m serves 14 plots.



Here the same road of 140 m serves 18 plots.



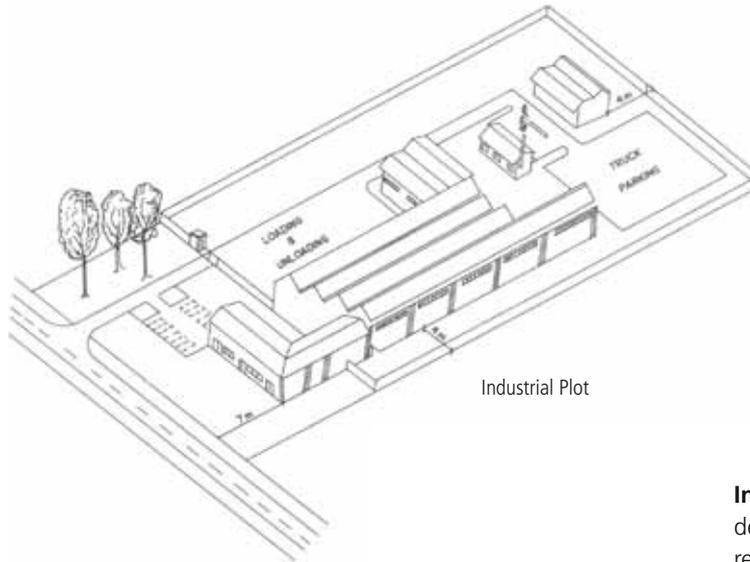
Typical frontage size of plots around city centre of Santiago de Chile

Planning rectangular parcels will mean bigger blocks of parcels, therefore less street length will be needed in the whole development project. In an urban context, where streets will be paved and public services implemented, frontage of residential plots should be the shortest possible.

In Latin America, there are still housing frontages of eight metres in width that have worked for more than 100 years. An adequate size for a residential plot front located near the city centre should be no more than 10-15 m. In recent new low-cost housing developments in Somalia, the average plot is nine metres.

## PLOT CHARACTERISTICS

Plots are the smallest subdivision of land and usually have four sides because of practical reasons: front, rear and sides. All plots should be connected to a street or a footpath on one side.



Industrial Plot

A **residential plot** will conform to a household's needs and resources, an industrial one will need to be much bigger to allow for production, storage and parking spaces. (Images from Development Control Code, 1995. Botswana).



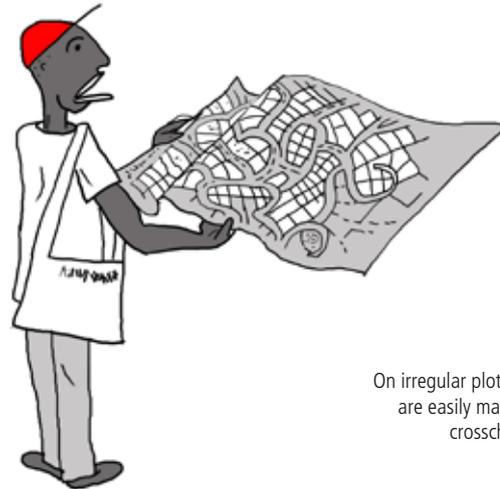
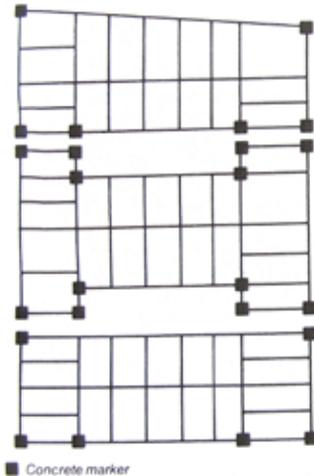
Residential Plot

**Institutional plots:** The size of plots allocated to government departments, and public/private institutions should be based on real and justified needs because these have historically often been larger than required.

## PLOTS SET OUT

Although original layouts in human settlements were rarely straight, they have become a straight grid in expansion areas almost all over the world because of the design's practicality. It makes setting it out on the ground reasonably simple.

As shown in the images alongside, the land markers have been easily set out, and from these, individual plots can be set out using a tape. If layouts are not designed in such a simple way, setting out can become a problem and plots will be difficult to locate. Landmarks were located in every corner to allow easy setting out of plots when handed over to the plot owners.

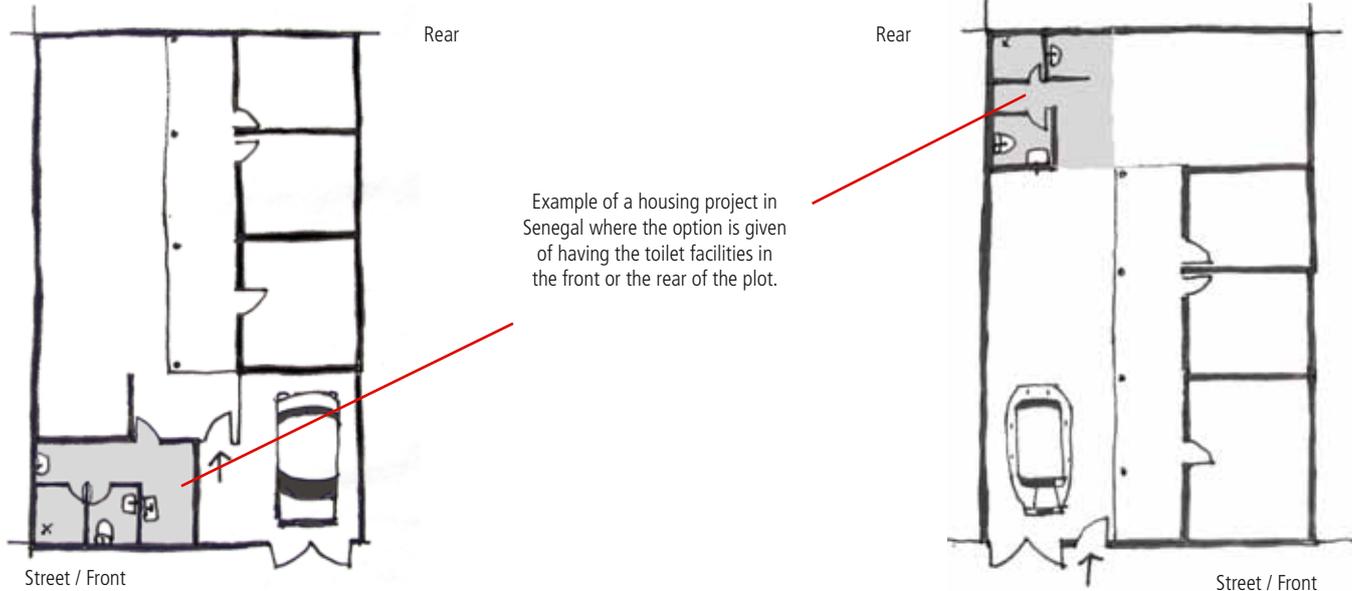


On irregular plot layouts, mistakes are easily made during field crosschecking.

**PLOT LAYOUT**

Plot layout will consider the current regulations and codes that govern distances of buildings to plot boundaries, (setbacks) provision of private open space, ventilation and day lighting standards. It should consider an off-street parking place of at least 2.5 x 5 metres. Roof and ground drainage must be included for each plot.

When planning plot layouts, one very important issue will be the location of sanitation facilities and access for a septic tank or pit latrine should be provided. This access should allow for the future connection to a public sewage system whenever it is implemented, without disturbing existing constructions.



## PLOT SIZE

A range of plot shapes and sizes should be considered wherever possible. Large plots should be placed along large roads and small plots along small roads.

This means different kind of demands can be satisfied. Big plots can combine residential activities with small scale businesses, workshops or other economic activities that are welcomed in the neighbourhood because they mean investment and employment in the area.

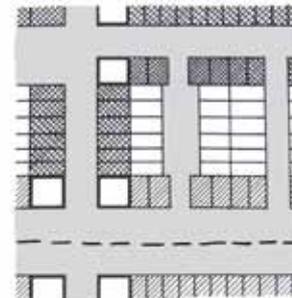


Big, medium size and small plots

## PLOT PRICING

Plots should be priced according to their location. A corner, for example, has more potential for use as a shop and plots on a main road have a higher potential value than those on small roads because they have a higher potential of being converted for commercial use.

The prices charged for these better placed plots allow remaining plots to be sold/leased at lower prices. This way, a neighbourhood can have plots classified as A, B or C. Some plots can be strategically located and reserved as "concession plots" that can be sold at the highest market price possible. Different plot sizes and frontages create more opportunities and, therefore, can be taxed accordingly.



Concession, A, B and C plots have different values according to their location. (Clifford Culpin and Partners, 1985).



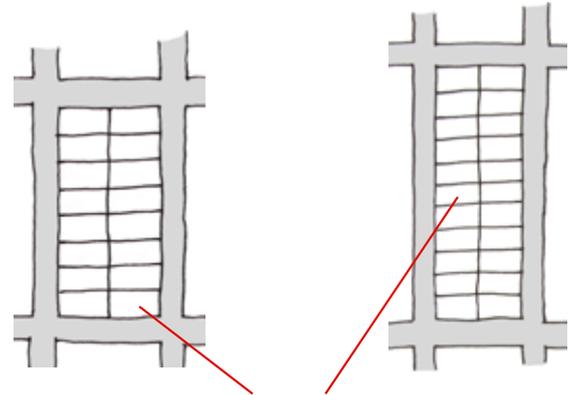
## MODULAR APPROACH

Planning of expansion areas should adopt a modular approach. This means preparing an integrated plan for a neighbourhood with a given population and an appropriate range of built-form, densities and public facilities and services.

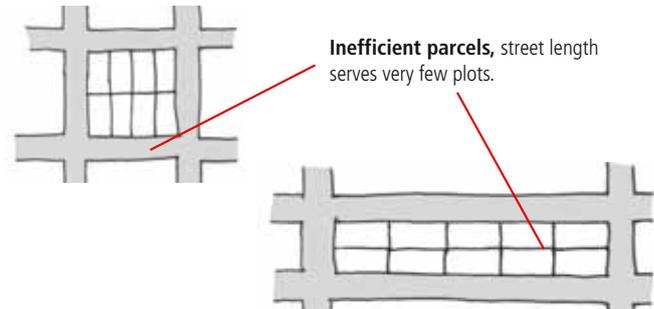
The neighbourhood is a settlement unit which people can identify and is often the basis for public administration and the provision of public facilities.

Residential plots can be organized into a hierarchy which can include the following:

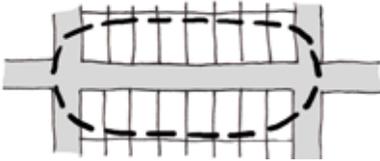
**Parcel:** or a double-lined group of plots surrounded by streets. These “islands” should be the largest possible (120 to 150m) to reduce number of streets and consequently the length of public utilities (pipes, energy, etc.). Plots fronting two streets should be avoided or featured only in rare cases where one of the streets is a major highway, or an arterial road. In these cases double fronted plots should be created with a reasonable buffer to separate the major street from the plots.



**Efficient parcels**, street length serves many plots in a parcel.



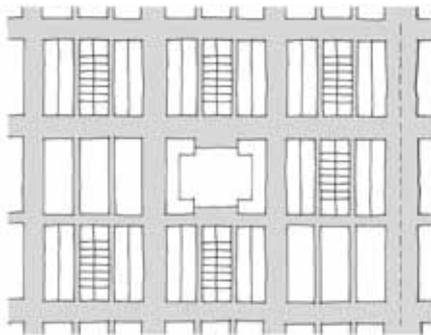
**Inefficient parcels**, street length serves very few plots.



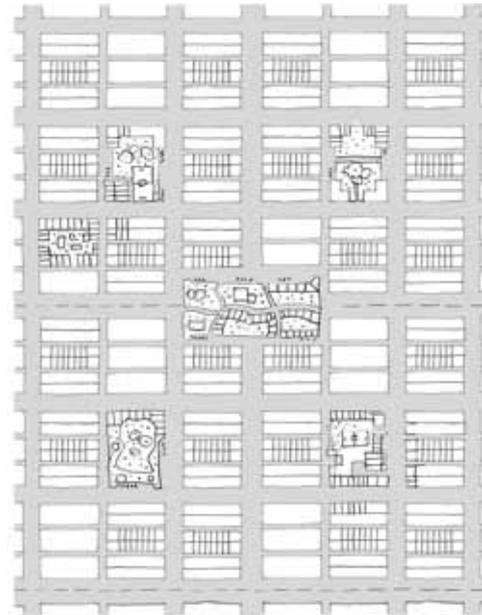
**Cluster:** Cluster: two rows of plots surrounding a common circulation space are called a cluster, where open space is generally for the use of households that share it. This allows a more efficient use of land.



**Block:** a group of parcels surrounded by public roads is a block.



**Module:** a group of blocks forms a module. Public spaces should be planned in every module to create buffers to prevent the typical, never-ending row of plots.



**Neighbourhood:** a group of modules forms a neighbourhood.

A neighbourhood should create a sense of community and belonging. This is achieved through a sensible layout that respects traditions, local climatic conditions and combines, in the best possible way, areas to live, work and play.

## 7 Infrastructure



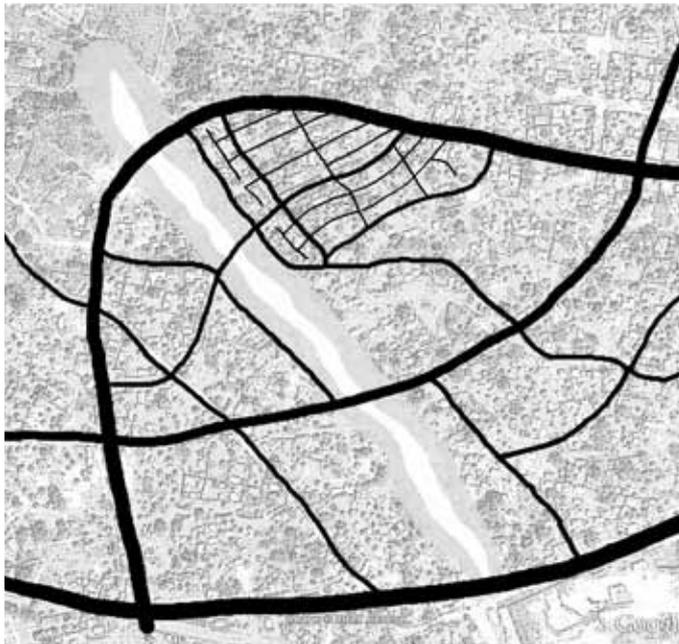
Expansion and upgrading of areas need infrastructure (water, sanitation, roads, drainage, electricity, etc.) to serve the needs of residential households, commercial operations (shops, markets, offices, workshops, etc) and social facilities (schools, clinics, etc).

These form the “skeleton” of the development layout, around which all the plots (housing, commercial, public facilities etc) will be located. Utility networks usually follow the road network.

Infrastructure is provided at different service levels in different areas. It will be sensible to plan for progressive standards of infrastructure and roads over time. The lowest standard is to fulfil the basic need of residents and it is quick and inexpensive to provide this standard of service and infrastructure. The highest level is not luxury but is more convenient for residents and needs more investment.

## Circulation

The roads and the vehicles used and parked on them have a very direct impact on the form, structure and direction of urban development.



A basic city grid is defined by main roads and reserved areas.

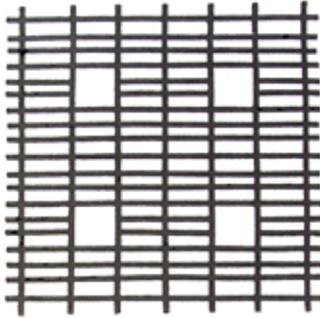
## STREETS HIERARCHY

Road hierarchy in new development areas has to be considered according to the roads' importance. It should be done at the planning stage because this will result in more efficient and safer traffic circulation, and will improve the quality of the local environment.

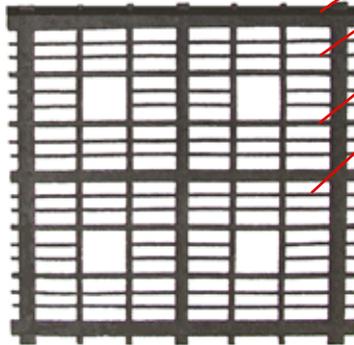
Uses or activities that generate a large volume of traffic should be located along or near a main road and easily accessed by public transport.

This includes large employment centres, for example government offices, hospitals, colleges and major commercial centres. If these are located on remote sites, far from the existing main road network, an expensive new access road has to be constructed or they will remain inaccessible.

Similarly, a well-planned street hierarchy can help create attractive and safe residential areas, and will ensure that the main distributor roads are routed around these areas, not through the residential area, to preserve the quality of life of the area.



Roads grid without hierarchy.



Roads grid with clear hierarchy.

## ROAD RESERVE WIDTHS

The table shows typical road reserve widths for five categories of road. Note that this includes footpaths, which should be planned as an integral part of the transport network.

### Typical urban road reserve width

Road Category	Road Function	Reserve width
Major Road	Arterial/Primary Distributor	30 – 40 m
Minor Road	Secondary Distributor	20 – 30 m
Minor Road	Local Distributor	10 – 20 m
Local Street	Access Road	8 – 12 m
Pedestrian/Cycle/Cart Access		3 – 6 m

**Distributor roads:** through-roads or roads going from one part of the town to another, in which ease of movement is prioritized over access to individual plots.

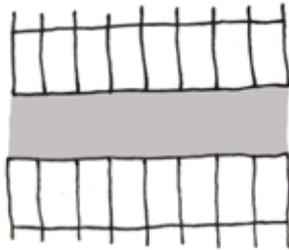
**Access roads:** provide access to individual activity centres or plots, in which local environmental quality is prioritized and so through traffic is discouraged or even prevented.

## ROAD WIDTH

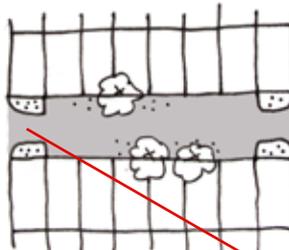
Road width should be determined by the function in the roads hierarchy – the width of roads in many residential areas is wider than is justified by the expected volume of traffic. There is a strong tendency for local development layouts to provide unnecessarily wide roads and there are many examples of residential layouts that have road reserves between 30 and 40m wide. If wide roads are planned in new settlements, it is wise to remember that this will considerably increase the cost of each plot.

Wide roads also encourage fast traffic, which increases the risk of accidents and take up large amounts of land for “non-productive” use.

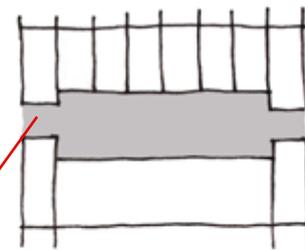
When the access street is excessive, some plots can be enlarged in the corners or green areas may be created as traffic calming devices, to restrict the entrance and discourage through traffic. This will improve privacy and security. The design of open small spaces serving groups of plots which residents use and maintain for example, gives residents greater control over the land in front of their plots.



Cluster where road has been planned too wide.

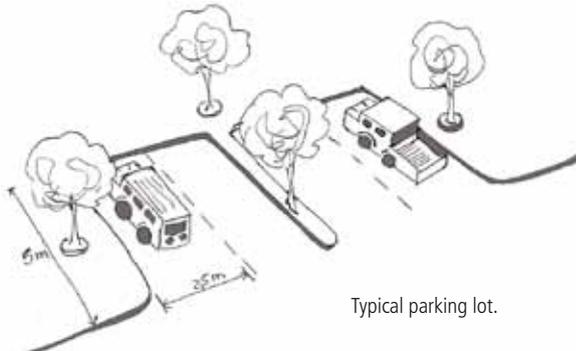


Clusters with restricted entrance to discourage through traffic.



## PARKING

Specific parking space will be required in commercial and industrial areas of the project. Provision should be made for off-highway/ carriageway parking in commercial areas.



## FOOTPATHS/PAVEMENTS

**Footpaths to serve housing plots:** Housing plots can be served effectively with footpaths. Access road of inner blocks can be connected through footpaths to larger roads that offer commercial activities.

Giving sensible consideration to these techniques when preparing layouts for development where conflicting traffic movements have to be resolved will significantly reduce the overall land requirement, without prejudicing the quality of development.

Providing pedestrian footpaths/pavements along main roads is important for the safety of pedestrians (who otherwise have to walk in the road) and to facilitate the flow of vehicle traffic (cars will not have to avoid pedestrians on the carriageway).



Footpath combined with road.

## CYCLING PATHS

Cycling is one of the most beneficial forms of transport available to cities. The benefits range from individual to social and from environmental to health, congestion, speed, safety and cost. All of these benefits are especially attractive to South Sudanese cities because will soon struggle with traffic congestion and severe environmental pollution. The relative affordability of a bicycle can help to bring transport equity to many South Sudanese residents who do not have adequate access to other transit means. Unfortunately, cycling is a dwindling activity in Juba. Efforts should be taken to revive it.



The bicycle uses much less space than motor vehicles, with up to ten bicycles fitting into a single car parking space. Also, because bicycles do not cause any air or noise pollution, they help create a more attractive urban environment for residents.



Footpath combined with cycle path.

But if we want to have these benefits in our cities, we ought to develop a transit infrastructure which is not hostile to both the pedestrian and the cyclist, and the only way to do this is to consider it in urban plans, at the point of designing their layout (by providing the necessary infrastructure for it).



Footpath combined with cycle path and road.

## Drainage

Urban drainage aims to address problems caused by rainfall runoff and water supply that is not consumed (and thrown away). A drainage system can incorporate both natural watercourses and built drains.

Lack of effective drainage causes deterioration of road/footpath surfaces and affects individual housing plots.

Standing water in badly drained areas on plots or around standpipes encourages breeding of insects and worms.



Cleaning drains in Malakal, 2008.

## Transport

The layout of streets should provide adequate and safe means of vehicular and pedestrian circulation.

We need to guarantee diverse transport options within the city, whether by bus, taxi, private car, on foot or by bicycle and motorcycle.

Public transport is a growing need as towns get bigger. Provision has to be made in the streets' layout for accessibility, bus stops and other activities and spaces related to it. Considering this aspect in the development project, even if transport has not yet developed in that area, will mean an advanced investment and therefore a better quality of neighbourhood in the future.

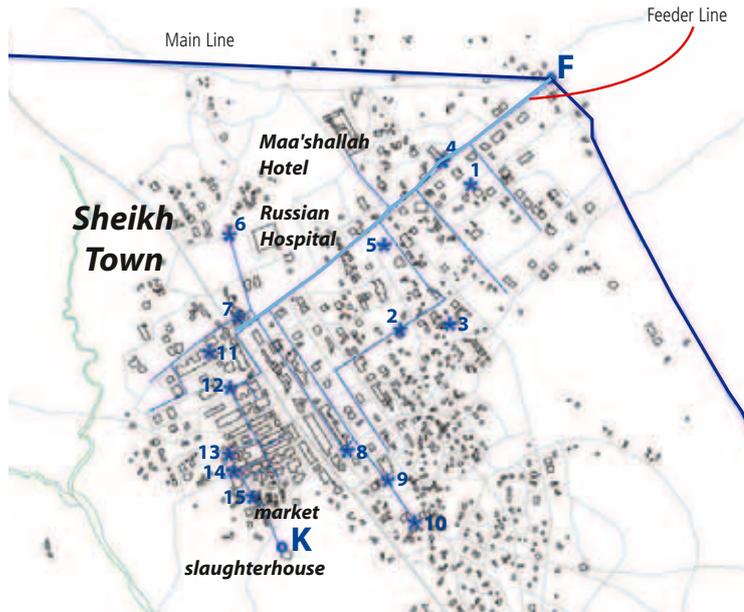
Planning the future public transport system will encourage private and government transport companies to extend transit services to that area.

The alternative, a disorganized community with no provision for road opening and finance for infrastructure, gets no attention for such development.

## 8 Services

The two principal aspects that need to be considered are water supply and the sewage disposal system. Their relation to the health of the population is a vital element in any development project.

Every effort should therefore be made to ensure access to safe drinking water and the sanitary collection and disposal of sewage.



An example of a water supply system for Sheikh, Somalia, where water distribution system and formal and informal water kiosks are indicated (UN-Habitat, 2010).

## Water supply

Water is an absolute necessity for life and impacts on health, hygiene, nutrition, convenience and comfort. Urban water supply usually comes from ground water reached by boreholes, or it is pumped from rivers and lakes into elevated storage tanks or tankers, carts etc for direct delivery to consumers.



## RAINWATER

Rainwater offers considerable potential:

- It is free;
- It is uncontaminated and safe to drink as long as storage is efficient. Greater effort should be made to save rainwater and recycle it for domestic and commercial use. This will require investment in reservoirs and individual household storage facilities, as well as public education programmes.



## Sanitation

Sanitation refers to the safe and hygienic disposal of human waste - excreta and urine - which is distinguished from other solid and liquid wastes that are disposed of by other means.

The method of sewage disposal is more important for sanitation planning than the type of toilet facility. Some current methods, such as pit latrines or septic tanks, require permeable ground conditions for liquids to percolate into the surrounding soil. Others are based on regular emptying of the receptacles.

All of them will need a periodic service unless they are connected to a pipe that carries the sewage to a treatment plant located some distance away.

The high cost of the pipe system means it will only be affordable to very few people, because it needs a large number of house connections to make it financially viable. It remains a long-term aspiration, but more affordable alternative solutions need to be used in the meantime.

## TREATMENT OF SEWAGE

A special facility is required for the safe and effective disposal and treatment of sewage and sludge that is removed from pits and septic tanks. The removal is usually done by means of a vacuum tanker truck, which then transports it to the treatment facility.

The site for the treatment facility needs careful consideration because it has specific technical requirements in terms of landform and ground conditions, and it must have a road access suitable for tanker trucks. The site will usually be located outside the urban area and away from habitation, because it is considered to be an unpleasant "neighbour".

In practice, a well-managed treatment plant gives off very little odour and can be integrated into the urban area – as is common in developed countries.

Designing water facilities in the front of the plot can be done in a simple way making the cleaning of latrines easier and not disturbing to the interior private rooms. Local traditions will generally reject it, but is getting to be a common practice as many housing projects do not see the possibility of connection to a public sewage system until a long time ahead.

## COMMUNITY TOILET FACILITIES

When ground conditions do not allow individual latrines to be built in individual plots, or there is great scarcity of water, community sanitation facilities will have to be implemented.

A typical block of community toilet facilities consists of toilet cubicles including washing facilities, which makes the facility a more comprehensive public health facility.

Simply constructing a facility and leaving it to take care of itself clearly does not work. But recent evidence from the region demonstrates that they can work if they are effectively managed.

A location will have to be chosen that does not interfere or disturb other activities.



**New public  
toilets at Yey  
Hospital, 2008.**

## Solid waste management

Solid waste management (SWM) refers to the safe and hygienic disposal of solid waste – otherwise known as refuse, garbage or rubbish. Domestic and industrial waste is a potentially serious health hazard – it creates breeding sites for disease carrying vectors: rodents (rats) and insects (ticks, fleas, flies, mosquitoes etc); and it encourages vermin, blocks drains, etc.

The methods for transporting waste will depend on the size of the neighbourhood and the volume of waste. This activity offers the potential to create local employment, refuse collectors, the manufacture of collection bins, recycling, handcarts, etc. The appropriate location and dimension for waste treatment will have to be chosen within the area, at the local and city level.



**Solid Waste  
management in  
Yei streets, 2008.**

## Electricity supply

Electricity supply is the simplest utility to provide because it is installed above ground and so is relatively cheap and “mobile”.

Electricity supply is an essential component of modern urban infrastructure – it is crucial for efficient commercial and public sector activities, and also for the quality of domestic life.

A domestic supply and lighting of public spaces are highly valued by low-income groups for the convenience and the stimulus they give to social and economic activities after dark. Where power is being extended to a neighbourhood, underground wiring should be preferred over overhead wiring.



## Street lighting

This is a relatively low-cost installation with significant social and economic benefits because it makes life after dark much simpler and safer.

Lighting of public areas (streets, footpaths, local markets, recreation areas, etc) is highly valued, both for the improved conditions it creates for evening/night-time social and commercial activities, and for the increased security.



## References

- Josep M. Llop, Torne (1999). *Intermediate Cities and World Urbanization*. Spain: UNESCO.
- Norway: *Design Without Borders, A Design Manual for a Network of Bicycle Routes in Guatemala City* (2010).
- Carter, Tom (2008). *Draft for Urban Management Guidelines*. Non published
- Carter, Tom (1985). *Land Development Guidelines*. Regional Ministry of Public Works, Transport and Communications. Juba, Sudan.
- Mayabi, Daniel (2011). *Scramble for Nairobi Suburbs*. Upnairobi. Free cultural magazine distributed in Nairobi.
- Davidson, Forbes and Payne, Geoff (eds) - Clifford Culpin and Partners (consultants) (1986). *Urban Projects Manual, A guide to Preparing Upgrading and New Development Projects Accessible to Low Income Groups*, Liverpool Planning Manual Series 1. Liverpool University Press (in association with Fairstead Press), pp. 160.
- Tribillon Jean François, *Villes* (2009). *Africaines- Nouveau Manuel d'Aménagement foncier*. Compiled by Carlos Trindade.
- Godin, Lucien (1987). *Preparation Des projets Urbains d'aménagement*, Document Technique de la Banque Mondiale No. 66F. Washington D.C.:Banque Mondiale, pp. 217.
- Republic of Botswana (1996). *Development Control Code (revised)*.
- Carmen Bellet Sanfeliu, Joep. M. Lolp Torne (2000). *Looking at Other Urban Spaces: Intermediate Cities*. Spain: United Nations Economic, Social and Cultural Organisation (UNESCO).
- UNESCO. *Guide Document - Data-Base Plan for Sustainable Development in Intermediate Cities*. Barcelona, Spain.
- Patrick Wakely, Tom Carter, Kate Clifford (2004). *Southern Sudan Urban Appraisal Study*. London: Development Planning Unit, University College. UNDP
- Betelehem Demissie and Akiko Kishiue (2010). *Urban Planning Manual for Somaliland*. Nairobi: UN-Habitat.
- Fernando Murillo (2010). *Settlement Upgrading Project in Hai Zandya, Juba*. Nairobi: UN-Habitat.
- UN-Habitat (2002). *Putting the Urban Poor on the Map. An Informal Settlement Upgrading Methodology supported by information technology*. Nairobi.
- UN-Habitat (2012). *Urban Energy Technical Note No 1*. Nairobi.
- United States Agency for International Development (2005). *Juba Assessment. Town Planning and Administration*.

## Planning Urban Settlements in South Sudan

All rights reserved.

United Nations Human Settlements Programme (UN-Habitat), 2012

P.O. Box 30030-00100, Nairobi GPO, KENYA

Tel: 254-020-7623120 (Central Office)

[www.unhabitat.org](http://www.unhabitat.org)

HS/115/12E

ISBN (Volume) 978-92-1-132529-4

### DISCLAIMER

The designations employed and the presentation of the material in this report do not imply the expression of any opinion whatsoever on the part of the Secretariat of the United Nations concerning the legal status of any country, territory, city or area or of its authorities, or concerning the delimitation of its frontiers or boundaries, or regarding its economic system or degree of development. The analysis conclusions and recommendations of this publication do not necessarily reflect the views of the United Nations Human Settlements Programme or its Governing Council.

## ACKNOWLEDGEMENTS

Project Supervisor:	Mathias Spaliviero
Principal Author:	Eduardo Feuerhake
Technical Advisor:	Laura Petrella
Contributors:	Anna MG Skibevaag, Akiko Kishive, Akonyu Akolo, Albert Padros, Fernando Murillo, John Hogan, Katja Dietrich, Ombretta Tempra, Shan Zheng, Sigrid Vesaas, Sven Erik Svendsen, Tom Carter
Publication Coordinator:	Ndinda Mwongo
Graphic Contributors:	Richa Joshi, Thamara Fortes
Photographs:	UN-Habitat archives
Editor:	Vicky Quinlan
Design and Layout:	Eduardo Feuerhake/Peter Cheseret
Printer:	UNON, Publishing Services Section, Nairobi, ISO 14001:2004-certified
Funded by:	SIDA/Sweden

South Sudan, like most countries, is experiencing rapid urbanization and, at the current rate, more than half its population will be living in cities within the near future.

Planning future cities and upgrading existing urban areas to accommodate growing numbers of people requires creativity, imagination and a range of technical skills. This manual is a guide for planners and surveyors who are preparing South Sudan's urban areas for future development, growth and an enhanced quality of life.

Different sections focus on specific areas of urban development, including planning at different scales, development and upgrading of existing areas, planning new development areas for different land uses, city layout and a brief introduction to infrastructure and services.

Orientations, concepts and the general knowledge for adequate urban planning is provided, from which a detailed step by step methodology can then be derived which matches the needs of each locality.

Cities will grow with or without planning, but those countries that are prepared for the future and the issues urbanization presents will be infinitely more successful. Millions of lives depend on South Sudan's leaders recognising that fact and seizing the opportunity they have to make a difference. The information contained here will help them get started.

HS/115/12E  
ISBN (Volume) 978-92-1-132529-4

United Nations Human Settlements Programme (UN-Habitat)  
P.O. Box 30030 00100 Nairobi GPO, KENYA  
Tel: 254-020-7623120 (Central Office)

**UN**  **HABITAT**

[www.unhabitat.org](http://www.unhabitat.org)