

Section 3b

Preparing Action Plans for Networked Services

Who should read this

- Senior local officials at town/city level, including: programme directors; programme component managers who are responsible for developing and implementing action plans for improving services for the poor in towns and cities.
- Senior technical support staff on attachment to the programme including NGOs and local/international consultants.
- Managers of other concerned line departments and their staff.

Objectives of this section

To propose a framework and supporting tools for developing Action Plans for networked infrastructure external to urban poor neighbourhoods in response to the demands of the Local Action Plans which in turn reflect the demands and priorities of service users in urban poor areas. This should be read in conjunction with Section 3a on local action planning and Section 3c on consensus building.

What this section tells you

Network Service Plans deal with the need to supply services through city wide networks in order to meet local demand as expressed in the Local Action Plans.

The **Municipal Ward** is the focus for developing Area Network Service Plans because it is often the focus for O&M activities and the base for local Councillors.

Co-ordination of Area Network Service Plans in each sector (water, drainage, power, solid waste collection, sewerage) is necessary to ensure that demands made on primary networks can be met. This could be done by a services coordinating committee for the town/city.

A **framework for networked services planning** is presented which comprises the following stages:

- establish contact
- find out what is there
- identify future plans
- assess likely additional demand
- assess the capacity of existing secondary and primary infrastructure
- identify shortfalls in capacity
- identify missing infrastructure links
- options for upgrading system capacity
- prepare indicative costs
- prepare draft Area Network Service Plans
- co-ordination of Area Network Service Plans at the town level

The following **supporting tools** are provided

- Initial groundwork (Tool 11)
- Components of infrastructure systems (Tool 12)
- Assessing system capacity (Tool 13)
- Preparing Area Network Service Plans (Tool 14)

The need for networked services planning

Networked services require supporting infrastructure which is external to the household and neighbourhood. These can be classified into ‘feeder’ and ‘collector’ networks. Examples of feeder networks include :

- piped water supply; and
- power supply.

Examples of collector networks include:

- main drainage;
- solid waste collection; and
- sewerage sanitation.

The purpose of Network Service Plans is to assess the capacity of existing primary and secondary infrastructure in each sector, and to consider what increases to this capacity are necessary in order to meet the expected demand generated through local action planning. Note that this increase in capacity will be achieved mainly through improvement to O&M of the existing infra-

structure along with the construction of some new works. Improving services at the local (tertiary) level directly affects the secondary and primary distribution/collection infrastructure and it is important that all components are adequately sized. No amount of increase in the size of tertiary mains will result in an improved service if the supply to the area is inadequate. Conversely, the full benefits of improvements in supply capacity will not be realised if the tertiary systems are inadequate.

This part of the action planning process is therefore about the practicalities of balancing demand for services at the local level with the supply capacity of the networked city systems. This must also include a realistic assessment of the extent to which the city wide systems are likely to be upgraded and extended. There is an important practical point to make here: it may not prove possible to satisfy all of the demand for services which are in the Local Action Plans. This is where the *consensus building* component of action planning comes to the fore; plans are of no use unless they are achievable.

Area networked services planning

What needs doing

The first stage in networked service action planning focuses on the Municipal Ward. One of the reasons for this is that Municipal Wards are often an important centre of action for certain basic O&M activities such as drain cleaning, street sweeping and collection of local taxes. Wards are the operational base for Councillors and are also a potential focal point for negotiating changes to Local Action Plans and determining responsibilities for carrying out O&M in the newly upgraded neighbourhoods.

The output of this stage is an Area Network Service Plan for the Ward which, depending upon the technical options used, could have the following distinct components:

- water supply;
- drainage;
- sewerage, if appropriate;
- solid waste management; and
- power supply.

Who does it

In developing the Area Network Service Plans you will need to involve officials of the appropriate agency. For example, there may be specialist line agencies for water and power, whilst the municipality deals with drainage and solid waste management. The Area Network Service Plan will in the main deal with secondary networks, but will also cover some parts of the primary networks. It is important to remember that the extent of particular infrastructure networks are determined by their 'command area'; these cross the administrative boundaries of municipal wards into Zones/Circles and to the town as a whole, especially the primary networks.

Coordinating Area Network Service Plans

What needs doing

In order to produce a Network Service Plan for the town, the various Area Network Service Plans need to be coordinated for each sector to ensure that the demands made on the primary networks which go beyond the limits of the individual area plans can be satisfied. This will be relatively simple for small towns but becomes more complicated for larger cities.

The output from this will be a Network Service Plan for each of the infrastructure sectors listed above. The activities include abstracting all of the proposed networked service improvements and marking them up on a base plan of the whole city. This needs to be done for each sector so that it provides an overview 'at a glance' of what is proposed. This also ensures that the improvements are compatible with the existing 'command areas': for example drainage needs to be dealt with on the basis of the overall catchment and drainage basins within the city; water supply may be managed on a zonal basis using different water sources.

Who does it

The obvious approach is to hand over the coordination and plan preparation according to the specific local institutional responsibilities as indicated above. The difficulty which arises with this approach is that the responsibility then rests with an institution which might have only a very limited interest in a demand responsive programme targeted at improving services for the urban poor.

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This could be addressed by setting up a ‘Services Coordinating Committee’ of senior officials from the concerned line agencies and municipal departments. This can provide an opportunity for information sharing and reporting back on progress, which may subsequently affect the direction of the networked services planning.

Even so, strong management and leadership is required from the institution with lead responsibility for implementing the services improvement programme. Depending upon local institutional arrangements and the attitude of individual officials, the Engineering Manager for the services improvement programme needs to drive and manage the process. This involves getting the different institutions and departments to deliver their plans and then coordinating their respective outputs. The Services Coordinating Committee could play a useful role here. It also helps if clear terms of reference are prepared for the work which is required from these other institutions and departments. Tool 13 *Assessing system capacity* provides guidance on what is required for the different sectors.

Framework for action planning for networked services

Table 3b.1 presents the framework for action planning for networked services; it gives a brief description of each component and refers to the various tools which describe the components in more detail, and provide help with what to do.

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Table 3b.1. Framework for action planning for networked services

Activity	Description	Further guidance
Establish contact	<p>Make contact with:</p> <ul style="list-style-type: none"> ■ key staff in relevant line departments of the municipality and in specialist line agencies e.g water, power supply ■ municipal councillors ■ offices of other politicians from the regional or national assemblies who may have development budgets under their control to introduce the ideas behind the programme for improving services ■ create a coordinating committee of officials from the agencies and the municipality. 	
Find out what is there	<ul style="list-style-type: none"> ■ Collect available maps and plans to locate existing infrastructure in each municipal Ward. ■ Identify proposed urban poor project areas in relation to existing primary & secondary infrastructure lines. 	Tool 11 Initial groundwork
Identify future plans	<ul style="list-style-type: none"> ■ Identify and collect detailed information from line departments and utilities on future plans for extending and upgrading infrastructure within the municipality, including maps and designs. ■ Identify how these proposed improvements affect those Wards in which upgrading is to take place. 	Tool 11 Initial groundwork

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Table 3b.1. (continued)

Activity	Description	Further guidance
Assess likely additional demand	<p>The Local Action Plan for each community which is to be upgraded is the key source of information.</p> <ul style="list-style-type: none"> ■ Abstract the assessments of the demand for improved services in each service sector. ■ Bring together these assessments for increased demand from each locality to be upgraded and from other new developments which can be identified in the Ward. This creates an overall picture for the Ward which forms a key part of the Area Network Service Plan. 	
Assess the capacity of existing secondary and primary infrastructure	<p>This is the key activity, which is both time consuming and complex.</p> <ul style="list-style-type: none"> ■ Note that the users provide essential information; each Local Action Plan contains a section on user perceptions of how well existing services perform and where problems occur. ■ Visit the localities to be upgraded to undertake some survey work on infrastructure condition. ■ Carry out calculations to assess actual capacity. 	<p>Tool 13 Assessing system capacity</p> <p>Tool 12 Components of infrastructure systems</p>
Identify shortfalls in capacity	<p>Identify potential supply problems in the secondary and primary infrastructure. Do this by comparing the assessments of existing capacity with the additional demands (see above).</p>	<p>Tool 13 Assessing system capacity</p> <p>Tool 12 Components of infrastructure systems</p>

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Table 3b.1. (continued)

Activity	Description	Further guidance
Identify missing infrastructure links	Identify where there are missing infrastructure links (e.g. water supply pipelines, outfall drainage channels) between localities to be upgraded and existing infrastructure lines.	
Options for upgrading system capacity	Area Network Service Plans for each sector need to propose ways to overcome the shortfalls in capacity of the primary and secondary infrastructure in the light of existing future plans of line departments and utilities.	<p>Tool 13 Assessing system capacity</p> <p>Tool 12 Components of infrastructure systems</p>
Prepare indicative costs	<p>These need to be split into costs associated with:</p> <ul style="list-style-type: none"> ■ improving O&M ■ new construction. 	Tool 16 Spreadsheets for cost estimation
Prepare draft Area Network Service Plans	<p>These incorporate:</p> <ul style="list-style-type: none"> ■ base plans identifying all relevant infrastructure in the area ■ assessment of existing capacity ■ identification of new demands ■ potential shortfalls in supply capacity ■ technical proposals for upgrading supply capacity to match expected demand ■ plans identifying proposed new infrastructure in the area ■ indicative costs of proposals. 	Tool 14 Preparing Area Network Service Plans
Coordination of Area Network Service Plans at the town level	Bring the individual Area Network Service Plans together to identify proposals across the town or city. This draft becomes the basis for discussions and negotiation with the line departments and possibly higher levels of government and external donors. Particular issues are the feasibility and cost of increasing the capacity of primary and secondary infrastructure.	<p>Tool 11 Initial groundwork</p> <p>Tool 13 Preparing Area Network Service Plans</p>

Preparing the Area Network Service Plans

An Area Service Plan needs to be prepared for each Municipal Ward when service improvements proposed in the Local Action Plan link into the city networks for infrastructure and service delivery, as indicated in Table 3b.2.

Table 3b.2. Preparation of Area Network Service Plans by sector	
Service Sector	Requirement for Area Network Service Plans
Water supply	Required only for piped supplies
Sanitation	Required only for sewerage sanitation
Surface drainage	Required
Power and Security lighting	Required
Solid Waste Management	Required
Access and paving	Required only for improved access links
Community buildings	Not required

Table 3b.3 suggests a structure for what the Area Service Plans should contain.

Table 3b.3. Suggested contents of Area Network Service Plans	
Section	Contents
Existing situation	<p>Service plans which are marked up on copies of the baseplan (see Tool 11) covering the entire Ward which identify:</p> <ul style="list-style-type: none"> ■ the location of primary and secondary infrastructure ■ the localities to be upgraded ■ any existing infrastructure links into the localities to be upgraded
Existing demands on infrastructure	<ul style="list-style-type: none"> ■ specify the estimated existing demands/loadings on the primary and secondary infrastructure lines in the area (see Tool 13 for suggested calculation details) ■ mark these demands/loadings on copies of the service plans
Capacity of existing infrastructure	<p>Estimate capacity of the primary and secondary infrastructure lines in the area:</p> <ul style="list-style-type: none"> ■ water: pipelines, pumping stations, storage reservoirs

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Table 3b.3. (continued)

Section	Contents
	<ul style="list-style-type: none"> ■ drainage: channels, canals ■ sewerage: sewers, pumping stations ■ power: transmission lines, transformers <p>These should be marked on the service plans</p>
New demands on infrastructure	<ul style="list-style-type: none"> ■ use the Local Action Plans for each of the neighbourhoods to be upgraded to obtain estimates of the expected new demands/loadings which needs to be supplied via the primary and secondary networks in each infrastructure sector ■ estimate the new total demands/loadings on the primary and secondary infrastructure lines in the area (see Tool 13 for suggested calculation details) ■ mark these demands/loadings on copies of the service plans
Identify capacity shortfall	<p>This is the justification for upgrading the primary and secondary systems.</p> <ul style="list-style-type: none"> ■ compare the estimated capacity of the infrastructure lines and items of equipment with the required loading
Identify missing links	Determine required capacity and mark up on service plans
Proposals for improvements	<p>List proposals for improvement in a Table, (see Tool 13 for suggested details); also identify them on a copy of the service plans for the area. These should be split into:</p> <ul style="list-style-type: none"> ■ improvements to the O&M of existing infrastructure ■ proposals for new works including new links between the neighbourhoods and existing networked infrastructure
Cost estimates	Prepare a table of indicative costs against each proposal
Proposals for financing	Identify possible sources of finance for the works (see Section 3c)
Implementation	Prepare a workplan indicating which organisation and department is to be responsible for each item of work, with possible start and end dates (see Section 3c)

Tools to support networked services planning

The following tools have been developed to support the activities required to carry out networked services planning: you will find these in the following part of this section of the manual.

Tools to support Action Plans for Networked Services	
Tool	Description
11	Initial groundwork
12	Components of infrastructure systems
13	Assessing system capacity
14	Preparing Area Network Service Plans

Tool 11 Initial groundwork

How this tool will help you

This tool provides you with guidance on collecting and assembling the baseline information about the primary and secondary infrastructure which is already there, and on the preparation of further maps and plans which identify the proposals for improving this infrastructure. This is essential in order to prepare Area Network Service Plans for each Ward.

Using this tool

The first stage in preparing Area Network Service Plans is to collect as much information as possible about the local services. Note that it is particularly important to meet with all of the service providing agencies and departments to discuss what plans they might have to improve and extend the infrastructure. We also suggest where to look for this information; obviously local officials are best placed to advise on this. The checklists are grouped as follows:

- what information to collect (Table T11.1); and
- what to prepare from the information which has been gathered; this will be used in developing the Area Service Plans (Table T11.2).

In summary, there are two key outputs from the initial groundwork which are essential to the success of action planning for networked services:

- establishing contact with the different service providing agencies and setting up a coordinating committee; and
- preparation of master service drawings for each Ward which can be marked up with the existing infrastructure in each sector; the proposed infrastructure improvements are also marked up. This provides an ‘at a glance’ view of the Network Service Plans.

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Table T11.1. Information gathering checklist

Information to collect	Suggestions on how to get the information
City Plan showing Ward/ political boundaries	Available in Municipality.
Identify larger scale base plans covering each Ward; suitable scales are between 1:5000 and 1:10,000	Municipality, Urban Development Authority. Also Land Revenue Department may have suitable scale plans which can be updated.
Establish the precise institutional responsibili- ties for planning, construc- tion and O&M of infrastructure by sector	It is essential to interview staff of all agencies, both at headquarters and in zonal or Ward offices. Remember that actual roles and responsibilities often differ from what the organogram of the agency says should happen.
Service plans showing existing secondary and primary infrastructure for water, sewerage, drainage, power	Available from line departments or utilities. Requires site visits to check for recent additions and upgrading.
Service plans showing future proposals and their time scale for extending infrastructure for water, sewerage, drainage, power	Most line departments and utilities have plans to expand their networks. It is essential to plan and carry out a detailed programme of interviews with key agency officials.
New areas earmarked for future development	Available from the Urban Development Authority and the Municipality. Remember to ask about possible developments by State and National authorities and industrial development corporations.
Preliminary population estimates for urban poor and other new project areas	This data is usually obtained as part of preliminary surveys during project preparation.

Table 11.2. Checklist of what to prepare

Items to prepare from information gathered

1. A definitive list of all identified urban poor project areas; although these will have been identified during project preparation, make sure each area has a unique serial number.
2. Prepare base plans for the area (this will normally be equivalent to a municipal Ward). Although these may already exist it is quite likely that there will only be old plans which require updating or redrawing to include the most recent developments. Draw base plans to a scale of about 1:5000; show all roads, topographical features, water courses etc.
3. Use these base plans to prepare master service drawings for each Ward indicating existing secondary and primary infrastructure facilities by sector. These will include details such as pipe and channel sizes, estimated capacities, and the location of plant such as power transformers and pumping stations.
4. Identify those areas earmarked for new development which are definitely likely to start up within the lifetime of the upgrading programme, say 5-7 years.
5. On a copy of the master service drawings, mark up proposed extensions to primary and secondary infrastructure by sector.

Tool 12 Components of infrastructure systems

How this tool will help you

Systems of primary and secondary infrastructure can be complicated; this tool lists the main components of infrastructure by sector which need to be considered in assessing supply capacity.

Using this tool

Before starting work on assessing the capacity of the existing infrastructure, refer to Tables T12.1 to T12.5 which describe the components. As you proceed with your subsequent work on assessing capacity use the Tables as checklists to ensure that you have considered all the relevant parts of the system.

Table T12.1. Main components of piped water supply systems

Component	Description
Production facilities	Intakes, water treatment works, tubewells.
Bulk supply mains	These carry water from production facilities to service reservoirs. They are only required where the source is remote from the supply area.
Service reservoir storage facilities	These allow variations in demand over the day to be balanced and may also provide some back-up capacity in the event of a break in supply.
Primary or trunk mains	These are intended to convey water in bulk from one part of the network to another. They will not normally be required where supply is from tubewells located at intervals throughout the supply area.
Secondary mains	These link tubewells, service reservoirs and trunk mains with service mains. They normally have diameters of 150mm or greater and are laid to form loops.
Tertiary or service mains	These are mains of 100mm diameter or less that distribute water locally. They are often branches rather than loops.
House and standpost connections	Typically 12-25mm diameter.

Table T12.2. Main components of drainage systems

Component	Description
Plot drains	These are small, shallow open channels (or pipes) which connect paved areas on the plot to the local tertiary drains; they often carry sullage from the kitchen.
Tertiary collector drains	These are usually roadside open channels which collect runoff locally from paved surfaces and sullage water from plots, unless a sewerage system exists or plots are large enough to accommodate soakage pits. In some cases overflows from septic tanks or pit latrines are discharged; this creates local environmental health hazards.
Storage ponds and tanks	Storage of drainage water has the effect of reducing the maximum flow which the actual drains have to carry during a storm. Flow through natural ponds has this effect; unfortunately there is rarely enough room to construct purpose made storage ponds.
Secondary collector drains	These link the tertiary to the primary, and are usually open channels about 1 metre wide.
Primary drains	Large open channels which form the 'spine' of the drainage network. The natural topography dictates the line of the primary drains; a town or city may have several independent drainage catchments as a result.
Receiving water	This is where the drained water is finally disposed of; usually a stream, river, pond, lake or the sea.

Table T12.3. Main components of sewerage systems

Component	Description
House sewers	These collect the household wastewater from flush toilets and sullage from kitchens and bathrooms; they are usually 100mm diameter pipes.
Tertiary collector sewers	These collect the flows directly from house sewers; they are usually 150mm or 250mm diameter pipes.
Secondary collector sewers	These link the tertiary to the primary.
Primary sewers	Large buried pipes, or sometimes open channels which form the 'spine' of the network. The natural topography dictates the line of the primary sewers; a town or city may have several independent sewerage catchments as a result.
Wastewater treatment	Some form of sewage treatment is essential to avoid environmental pollution of the receiving water.
Receiving water	This is where the treated sewage effluent is finally disposed of; usually a stream, river, pond, lake or the sea.

Table T12.4. Main components of solid waste management systems

Component	Description
Household or communal storage	Storage of waste in household or communal containers.
Selling waste	Householders sell waste which has a value (glass, metal, paper) to itinerant waste buyers.
Primary collection	Emptying of household or communal containers and removal of the waste using small vehicles (note that the term 'primary' is confusing with respect to the other infrastructure sectors).
Transfer	A designated location serving an area as large as a municipal Ward where the waste from primary collection is unloaded prior to reloading for longer distance transportation
Haulage	Transport of waste from transfer station to more distant waste disposal facilities.
Disposal	Adequate waste disposal is necessary, for example by sanitary landfill or localised neighbourhood composting.

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Table T12.5. Main components of power and security lighting systems

Component	Description
Production	Power plants which feed into grids covering a much larger area than water supply systems.
Primary distribution mains	High voltage lines which carry electricity in three phases at high voltage to district sub-stations.
District sub-station	The voltage of the supply is stepped down via transformers before distribution to users.
Local distribution	Low voltage power lines taken from the sub-station to distribute power around the site; usually less than 200m long. Overhead lines are cheaper than buried cables.
House connection	Single connections from the local distributor to a power meter in the house, from where power is distributed internally.

Tool 13 Assessing system capacity

How this tool will help you

In this tool, we provide guidelines for assessing whether there is adequate capacity in the secondary distribution and collection networks and in the local tertiary networks. You are also guided to the tools in Section 4 *Technical Guidelines* which deal with planning and design of services in more detail.

How to use this tool

Analysing system capacity is complicated and you need information about how the system works. You can do this by carrying out the following three activities.

- 1. Use the Local Action Plans** to tell you how the services perform at the moment, and what the users perceptions of this performance are. You can abstract valuable information from these plans to guide you on where there are gaps in the supply systems.
- 2. Look for simple things:** you can improve your understanding of the findings from Local Action Plans by going to sites, observing what is happening, making a few measurements and asking further questions. This needs to be done by a team with a good mix of technical and social skills.
- 3. Carry out calculations** to determine the theoretical capacity of the systems and the new demands which they will have to deal with as a result of increased demands. The information obtained from the two previous stages helps you to identify what needs to be calculated. Section 4 *Technical Guidelines* tells you how to do the necessary calculations.

The material in this tool is presented in turn for each of the main infrastructure sectors.

Checklist for existing situation for drainage

Notes on how to use Table T13.1

- Column 1 tells you the sources of information
- Column 2 tells you what you can find out from these sources of information
- Column 3 states what this actually tells you about the problem
- Column 4 advises you as to the next steps you should take as a result of what you have found out
- Column 5 directs you to the tools in Section 4 of the manual on Technical Guidelines

Table T13.1. Checklist for existing situation for drainage

Source	What to find out	What it tells us	Action and outcome	Further guidance
From Local Action Plans	1. Existing and future areas to be drained	1. Basis for estimating loading on drainage systems	1. Input to local and area network system design	1. See point 9
	2. Location of flooding and low lying areas	2. Where the problems are concentrated	2. Input to local action plans: possible need for local landfill	
	3. Frequency of flooding in particular areas	3. Magnitude of the problem, and possible problems off site due to inadequate secondary system	3. Input to Local and Area Network Service plan	3. See point 9
	4. Where does water drain to after a storm	4. Natural drainage paths	4. Input to Local Action Plans: location of possible new drains and outfall points	
	5. What problems there are with blockage of existing drains	5. Possible causes of blockage and drainage problems; inadequate maintenance	5. Input to Local and Area Network Service Plans: roles & responsibilities for drain cleaning; discuss with Operations Dept.	5. Refer to solid waste management checklist

Table T13.1. (continued)

Source	What to find out	What it tells us	Action and outcome	Further guidance
From site inspection and interviews	<p>6. Physical condition of the outfall points, any obstructions or restrictions to flow</p> <p>7. Water levels in outfall drains and relative bed levels of tertiary and secondary drains at outfall point</p> <p>8. Extent of silting</p>	<p>6. Many problems with drainage result from downstream conditions</p> <p>7. This determines the water levels in the tertiary drainage system</p> <p>8. Blockages further downstream or gradient of drain not steep enough or inadequate maintenance</p>	<p>6. Input to Local Action Plan: minor improvements to outfall can significantly improve performance.</p> <p>7. Input to calculation of water levels in drains</p> <p>8. Input to Local and Area Service Plans: cleaning and/or regrading of some drains</p>	<p>7. See points 11 & 14</p>
By calculation	<p>9. Runoff from existing tertiary area when upgraded</p> <p>10. Capacity of existing tertiary drains</p>	<p>9. Loading on tertiary and secondary drains</p> <p>10. Adequacy of existing tertiary drains; need for new, or enlargement of existing, drains</p>	<p>9. Input to local and area network system design</p> <p>10. Include details in Local Action Plan</p>	<p>9. See point 13</p>

Table T13.1. (continued)

Source	What to find out	What it tells us	Action and outcome	Further guidance
By calculation	11. Design of new or uprated tertiary drains to cope with new loading	11. Local network design	11. Include details in Local Action Plan	11. Tool D3
	12. Capacity of existing secondary drains	12. Adequacy of existing secondary drains; need for new, or enlargement of existing, drains	12. Input to Area Network Service Plan	12. Tools D2 and D3
	13. Design of additional or redesign of existing secondary drains for new loadings	13. Area network design	13. Input to Area Network Service Plan	13. Tool D3
	14. Hydraulic profiles in secondary drains	14. Determination of invert levels for tertiary drains at outfall into secondary drain (new or reconstructed)	14. Input to Local Action Plan and Area Network Service Plan	14. Tool D3

Doing the calculations

Table T13.2. tells you where you can find details about how to actually carry out the designs and calculations which are referred to in Table T13.1. These tools and handy tips are in Section 4 of the manual.

Table T13.2. Tools for further guidance	
Tool	Guidance on
D1	Drainage: objectives and options
D2	Drainage: planning
D3	Drainage: design
D4	Drainage: handy tips on where to use, construction and O&M

Checklist for existing situation for water supply

Notes on how to use Table T13.3.

- Column 1 tells you the sources of information
- Column 2 tells you what you can find out from these sources of information
- Column 3 states what this actually tells you about the problem
- Column 4 advises you as to the next steps you should take as a result of what you have found out
- Column 5 directs you to the tools in Section 4 of the manual on Technical Guidelines

Table T13.3. Checklist for existing situation for water supply				
Source	What to find out	What it tells us	Action and outcome	Further guidance
From Local Action Plans	1. Future water demand	1. Required flow rates within the system and location of demands	1. Input to local and area network system design	1. See point 10
	2. No. of supply hours per day at present	2. Is there enough water in the system? Problems with bulk supply and possibly service reservoir storage	2. Input to Area Network Service Plans: discuss increasing supply hours with Operations Dept.	
	3. Seasonal reliability of non-piped supplies	3. Need for new or upgraded piped supply to supplement existing sources	3. Input to local and area network system design	
	4. Quality and potability of water	4. Users perceptions may be reflected in demand	4. Input to Area Network Service Plans: review problems with operations department	

Table T13.3. (continued)

Source	What to find out	What it tells us	Action and outcome	Further guidance
From site inspections and inter-views	5. Measure residual pressure at taps	5. If less than 5m, too low; either tertiary or secondary or both distribution systems are inadequate	5. Calculate headloss in tertiary systems	5. See point 10
	6. Measure pressure at or near take off from secondary main	6. If less than 8-10m too low; secondary mains are inadequate	6. Calculate headloss in secondary main	6. See point 12
	7. Interruptions to supply from bursts & other system failures such as pumping	7. Problems with O&M of network	7. Input to Area Network Service Plans: discuss targeting investments with Operations Dept	
	8. Existing pumping capacity into local secondary mains	8. Adequacy of existing pumping systems	8. Check against requirements for new demand	8. See point 14; Tool W2
	9. Existing service reservoir storage capacity	9. Adequacy of storage to balance daily variations in demand	9. Check against requirements for new demand	9. See point 14; Tool W2

Table T13.3.(continued)				
Source	What to find out	What it tells us	Action and outcome	Further guidance
By calculation	10. Head loss along existing tertiary network pipes using new demand when upgraded	10. Adequacy of existing pipeline capacity	10. Input to point 11	10. Tool W3
	11. Design of new or uprated tertiary pipelines to cope with new demand	11. Local network design	11. Input to Local Action Plan	11. Tool W3
	12. Headloss along secondary mains under new water demand	12. Adequacy of existing pipeline capacity	12. Input to point 13	12. Tool W3
	13. Design of new or uprated secondary pipelines	13. Secondary network design	13. Input to Area Network Service Plan	13. Tool W3
	14. New pumping and storage requirements	14. Investigate how best to balance out increased pumping with increased storage	14. Input to Area Network Service Plan	14. Tool W2

Doing the calculations

Table T13.4. tells you where you can find details about how to actually carry out the designs and calculations which are referred to in Table T13.3. These tools and handy tips are in Section 4 of the manual.

Table T13.4. Tools for further guidance	
Tool	Guidance on
W1	Water supply: objectives and options
W2	Water supply: planning
W3	Water supply: design
W4	Water supply: handy tips on where to use, construction and O&M

Checklist for existing situation for sewerage

Notes on how to use Table T13.5

- Column 1 tells you the sources of information
- Column 2 tells you what you can find out from these sources of information
- Column 3 states what this actually tells you about the problem
- Column 4 advises you as to the next steps you should take as a result of what you have found out
- Column 5 directs you to the relevant tool in Section 4 of the manual on Technical Guidelines

Table T13.5. Checklist for existing situation for sewerage				
Source	What to find out	What it tells us	Action and outcome	Further guidance
From Local Action Plans	1. Existing and future sewer connections	1. Basis for estimating loading on sewerage systems	1. Input to local and area network system design	2. See point 6
	2. Frequency of sewage backing up; overflowing manholes and/or toilets which won't flush properly some of the time	2. Local blockages or possible problems off site due to inadequate secondary system including lack of pumping capacity	2. Input to Local and Area Network Service Plans: explore operation of local sewage pumping stations	
	3. Location and frequency of sewer blockage	3. Identifies problem areas in tertiary system	3. Input to Local Action Plan for remedial works to remove local blockages	

Table T13.5. (continued)

Source	What to find out	What it tells us	Action and outcome	Further guidance
From site inspection and interviews	<p>4. Sewage levels in secondary sewer and relative invert levels of tertiary and secondary sewers at outfall point</p> <p>5. Missing or damaged manhole covers</p>	<p>4. This determines the sewage flow levels in the tertiary sewerage system</p> <p>5. The most common way in which solid matter gets into sewers and blocks them</p>	<p>4. Calculate 'water' level of sewage in tertiary sewers</p> <p>5. Input to Local Action Plan: replace covers and explore the cause of the problem</p>	<p>4. See points 8 & 11</p>
By calculation	<p>6. Outflow from existing tertiary area when upgraded</p> <p>7. Capacity of existing tertiary sewers</p> <p>8. Design of new or redesign of existing tertiary sewers for new loading</p>	<p>6. Loading on tertiary and secondary sewers</p> <p>7. Adequacy of existing tertiary sewers; need for new sewers</p> <p>8. Local network design</p>	<p>6. Input to local and area networked systems design</p> <p>7. Include details in Local Action Plan</p> <p>8. Include details in Local Action Plan</p>	<p>6. Tool S5</p> <p>7. Tools S4 and S5</p> <p>8. Tools S4 and S5</p>

Table T13.5. (continued)				
Source	What to find out	What it tells us	Action and outcome	Further guidance
By calculation	9. Capacity of existing secondary sewers	9. Adequacy of existing secondary sewers	9. Include details in Area Network Service Plans	9. Tool S5
	10. Design of additional or redesign of existing sewers for new loadings	10. Area network design	10. Include details in Area Network Service Plans	10. Tool S5
	11. Hydraulic profiles: relative water levels and invert levels of outfall sewer and tertiary sewers	11. Important effect on how well the system will operate. Determination of invert levels for tertiary sewers at outfall into secondary sewer (new or reconstructed)	11. Input to Local Action Plan and Area Network Service Plan	11. Tool S5

Doing the calculations

Table T13.6. tells you where you can find details about how to actually carry out the designs and calculations which are referred to in Table T13.5 . These tools and handy tips are in Section 4 of the manual.

Table T13.6. Tools for further guidance	
Tool	Guidance on
S1	Sanitation: objectives and options
S4	Sanitation: sewerage planning
S5	Sanitation: sewerage design
S6	Sewerage: handy tips on where to use, construction and O&M

Checklist for existing situation for power supply

Notes on how to use Table T13.7

- Column 1 tells you the sources of information
- Column 2 tells you what you can find out from these sources of information
- Column 3 states what this actually tells you about the problem
- Column 4 advises you as to the next steps you should take as a result of what you have found out
- Column 5 directs you to the tools in Section 4 of the manual on Technical Guidelines

Table T13.7. Checklist for existing situation for power supply				
Source	What to find out	What it tells us	Action and outcome	Further guidance
From Local Action Plans	1. Existing and future demand	1. Power load requirements within the system	1. Input to local and area networked system design	1. See point 6
	2. No. of supply hours per day	2. Insufficient power available; possible problems with primary distribution	2. Input to Area Network Service Plans: discuss increasing supply hours with Operations Dept.	
From site inspections and interviews	3. Voltage at end of local distributor lines	3. If less than operating requirement either local distributor line is too long or the demand on the transformer is too large or both	3. Calculate transmission losses	3. See point 10
	4. Distance to local step down transformer	4. Check within recommended limits; maybe too far away for local distributor lines to maintain voltage	4. Input to local and area networked system design: discuss additional 3 phase supply and transformers	4. See points 7&10

Table T13.7. continued

Source	What to find out	What it tells us	Action and outcome	Further guidance
From site inspections and inter-views	5. Interruptions to supply from system equipment break-down	5. Problems with O&M of network	5. Input to Area Network Service Plans: discuss targeting investments with Operations Dept.	
By calculation	6. Transmission losses along tertiary lines using new demand when upgraded	6. Adequacy of existing trans-mission lines	6. Input to point 7	6. Tool P3
	7. Design of new or uprated power lines to cope with new demand	7. Local network design	7. Input to Local Action Plan	7. Tool P3
	8. Transmission losses along main supply lines using new demand	8. Adequacy of existing trans-mission lines	8. Input to point 9	8. Tool P3
	9. Design of additional main supply lines	9. Secondary network design	9. Input to Area Network Service Plan	9. Tool P3
	10. Requirements for additional step-down transformers	10. Secondary network design	10. Input to Area Network Service Plan	10. Tools P2 and P3

Doing the calculations

Table T13.8. tells you where you can find details about how to actually carry out the designs and calculations which are referred to in Table T13.7. These tools and handy tips are in Section 4 of the manual.

Table T13.8. Tools for further guidance	
Tool	Guidance on
L1	Power supply & lighting: objectives and options
L2	Power supply & lighting: planning
L3	Power supply & lighting: design
L4	Power supply & lighting: handy tips on where to use, construction and O&M

Checklist for existing situation for solid waste management

Notes on how to use Table T13.9:

- Column 1 tells you the sources of information
- Column 2 tells you what you can find out from these sources of information
- Column 3 states what this actually tells you about the problem
- Column 4 advises you as to the next steps you should take as a result of what you have found out
- Column 5 directs you to the tools in Section 4 of the manual on Technical Guidelines

Table 13.9. Checklist for existing situation for solid waste management

Source	What to find out	What it tells us	Action and outcome	Further guidance
From Local Action Plans	1. Collection frequency 2. Location of communal containers 3. Location of transfer points	1. If less than once per week, service is inadequate 2. If more than 50 metres from houses, unlikely to be used 3. Accessibility of transfer point by collection vehicles	1. Input to Area Network Service Plans; discuss improvements at Ward level 2. Input to tertiary design; improve location of bins, and investigate option of household collection using privately engaged sweepers 3. Input to Area Network Service Plans	2. Tool SW3 3. Tool SW1
From site inspections and interviews	4. Visual appearance 5. Drain blockage by solid waste	4. Attitude of residents towards clean environment 5. Poor solid waste management is causing problems with the drainage system	4. Consider need for awareness raising on clean environment issues 5. Input to Local and Area Network Service Plans; discuss at local and ward level	4. See Tool 7, section on 'Stimulating demand by active promotion'

Table 13.9. (continued)				
Source	What to find out	What it tells us	Action and outcome	Further guidance
Operational: Ward office	6. Availability of municipal staff 7. Availability of vehicles for collecting waste from transfer points 8. Availability of other simple equipment	6. - 8. Resources available for use in the area	6. - 8. Input to Area Network Service Plans: need to negotiate at the Ward level to determine how best the existing resources can be allocated	6. - 8. Tools SW2 and SW3

Doing the calculations

Table T13.10. tells you where you can find details about how to actually carry out the designs and calculations which are referred to in Table T13.9 . These tools and handy tips are in Section 4 of the manual.

Table T13.10. Tools for further guidance	
Tool	Guidance on
SW1	Solid waste management: objectives and options
SW2	Solid waste management: planning
SW3	Solid waste management: local initiatives

Tool 14 Preparing Area Network Service Plans

How this tool will help you

This tool helps you to prepare that part of the Area Network Service Plans which deal with the proposals for improvements to the primary and secondary infrastructure. It is based on the outcome of using Tool 13, which provides guidance on assessing the capacity of infrastructure systems to deliver services both at the local (tertiary) and area (secondary) levels under existing and future planned conditions. This tool abstracts the key points from Tool 13 which relate to the preparation of Area Network Service Plans.

How to use this tool

Your proposals for improvements need to summarise the findings of Tool 13 in a clear and concise way. Table 14.1 picks up the key findings from Tool 13 by service sector. You should provide answers to these questions as far as is possible; you can use these answers as the inputs into the proposals for improvement section of the Area Network Service Plans.

Many of the questions will have quite clear answers, where you can specify technical details such as the size and location of new pipe runs or channels. However, you will not have definite answers to a number of important questions because there are some issues which will become the subject of discussions with the various line departments. For example, the Area Network Service Plan for water supply could include an action along the lines of *discuss changes to the operation of the local pumping station*. Similarly for drainage, it could include *discuss drain cleaning programme with Operations department*. It is important to realise that these issues need to be raised at the coordinating committee (see Table 3b.1, Framework) and then taken forward into the next stage of plan development, namely Consensus Building. Remember, just because we specify an action in the plan does not mean that it will automatically take place.

Table 14.1. Points to include in Area Network Service Plans

Sector	Input to Area Network Service Plans
Drainage	<ul style="list-style-type: none"> ■ capacity of existing drainage infrastructure ■ required capacity of drainage infrastructure ■ discuss drain cleaning programme with Operations Dept. ■ any changes to secondary drains to allow for increased loading ■ details of additional drains or redesign of existing drains ■ relative invert levels and details at outfall points of tertiary drains (new or reconstructed)
Water supply	<ul style="list-style-type: none"> ■ capacity of existing water supply infrastructure ■ required capacity of water supply infrastructure ■ any changes to local network storage and pumping to allow for increased demand ■ if supply hours are infrequent, discuss increasing supply hours with Operations Dept. ■ if there are interruptions to supply due to equipment failure, discuss targeting investments with Operations Dept. ■ amendments to secondary mains ■ amendments to pumping system ■ improvements to local storage and bulk supply
Sewerage	<ul style="list-style-type: none"> ■ capacity of existing sewerage infrastructure ■ required capacity of sewerage infrastructure ■ details of additional sewers or redesign of existing sewers ■ relative invert levels and details at outfall points of tertiary sewers ■ discuss operation of local sewage pumping stations with Operations Dept. ■ discuss sewer cleaning programme with Operations Dept.
Power supply	<ul style="list-style-type: none"> ■ capacity of existing power supply infrastructure ■ required capacity of power supply infrastructure ■ if supply hours are infrequent, discuss increasing supply hours with Operations Dept. ■ if there are interruptions to supply due to equipment failure, discuss targeting investments with Operations Dept. ■ amendments to secondary power lines ■ additional requirements for transformers
Solid waste management	<ul style="list-style-type: none"> ■ additional transfer points ■ discuss improvements to local operations at Ward level for including: local waste collection frequency, operation of transfer stations, haulage and disposal