

Section 6

Operation and Maintenance

Who should read this

- Senior local officials (Programme Directors, Programme Sector Managers) and their staff who are responsible for developing and implementing action plans for improving services for the poor in towns and cities. Local Executive Engineers who are responsible for operation and maintenance.
- Also Programme Sector Managers from the donor agencies and technical support partners including NGOs and local/international consultants.

Objectives of this section

To present different strategies for managing operation and maintenance and to consider how these can be applied to produce detailed plans for improved operation and maintenance at the neighbourhood, Ward and Municipal levels.

What this section tells you

Many **service improvements** will be achieved through better operation and maintenance rather than by the construction of new works.

Improvements to operation and maintenance are the most important yet the **most difficult** things to achieve.

Ways of **managing operation and maintenance** include:

- centrally managed by the public sector or its contractors;
- locally managed by user groups or small local enterprises;
- householder managed.

Whatever can be managed at the **household level** is best done so.

Find out about **user perceptions** of operation and maintenance of services.

Find out about the existing situation for **municipal performance** of operation and maintenance of services.

Operation and maintenance is the key component of local action plans which need to address the following:

- understand operation and maintenance requirements;
- explore user perceptions;
- assess willingness to participate in operation and maintenance;
- make user group plans; and
- ensure accountability checks are in place.

Handy tips on operation and maintenance are given for each of the service sectors in the 'Handy tips' tools in Section 4 of the manual.

Establish **roles and responsibilities** through Ward Committees and prepare Memorandums of Understanding to reflect this.

Improving the performance of municipalities and line agencies is the critical long term institutional development issue.

Actions to assist with the **monitoring and evaluation** of the performance of operation and maintenance envisaged in the Area Network Service Plans can include:

- establish a Ward complaints register;
- audit of complaints register;
- maintain infrastructure asset registers;
- performance monitoring; and
- maintain work registers.

Different ways of managing Operation and Maintenance

Section 1 of this manual briefly described different options for managing urban services. Regarding operation and maintenance (O&M) these can be defined as follows.

Table 6.1. Operation and maintenance management systems

Management System	Examples	Implications
<p><i>Centrally managed</i></p> <ul style="list-style-type: none"> ■ Private service connections to individual plots which require supporting networked infrastructure 	<ul style="list-style-type: none"> ■ Piped water supply ■ Sewerage 	<p>Public institutions have statutory responsibility for service delivery and O&M either directly or through their private sector contractors</p>
<p><i>User group managed</i></p> <ul style="list-style-type: none"> ■ Non-private facilities which are shared by members of a user group; depending on the technology adopted, these may or may not require supporting networked infrastructure 	<p><i>With networked infrastructure</i></p> <ul style="list-style-type: none"> ■ Piped water to public standposts ■ Sewered communal or shared latrines <p><i>Without networked infrastructure</i></p> <ul style="list-style-type: none"> ■ Communal handpumps or wells ■ Communal latrines linked to pits or septic tanks 	<p>A group of users is responsible for O&M; if there is networked infrastructure, roles and responsibilities for O&M need to be carefully defined between the users and external agencies.</p> <p><i>Local small enterprises</i> have a lot of potential for managing services at this level; local solid waste collection is a good example</p>
<p><i>Household managed</i></p> <ul style="list-style-type: none"> ■ Private on-plot services which do not require networked infrastructure 	<ul style="list-style-type: none"> ■ On-plot wells, handpumps ■ Latrines linked to on-plot pits or septic tanks 	<p>Responsibility for O&M of privately owned on-plot facilities rests with the owner/plot holder and there is much less of a management issue here</p>

Limitations of centrally managed systems. This relates to both the capacity and performance of the institution and the extent of the service coverage particularly into urban poor settlements. The lack of strategic O&M planning for the medium to long term is especially common. Typical problems include:

- inter-agency disagreements about responsibility;
- the agency responsible for construction often hands a system over to a different agency for O&M;

- O&M requires special skills such as the need to relate to predominantly poor customers and develop innovative solutions; and
- there is often no real link between service charges and/or local taxation paid by consumers and the level of operational service supplied. This financial structure means that there is little if any financial leverage which consumers can exert.

Local user group management approaches involve residents and community groups undertaking to manage aspects of neighbourhood work; this could involve people both doing things themselves and/or hiring labour for routine and skilled tasks. There are instances of residents in urban poor communities contributing towards the cost of hiring a sweeper for latrine cleaning and removing solid waste. Here we have *residents managing a service*, and in it a good illustration to help move away from the traditional idea that poor people have to do everything themselves. However, the evidence suggests that this approach has limits because:

- the activities have to reflect both the willingness to participate and the capacity of the residents;
- major repairs require a degree of technical and contractual input, and therefore risk, which residents may be unprepared to take on;
- in order for collective maintenance to work, *increased* interaction between residents and the responsible institution is required, rather than less;
- collective maintenance is not a means by which ineffective institutions can shelve responsibilities for O&M; and
- it requires a clear understanding of roles and responsibilities including how to interface with formal institutions in order to cover the eventualities of major works.

Household managed systems: responsibility for O&M of privately owned on-plot facilities rests with the owner/plot holder. In this respect, on-plot facilities have enormous advantages. For example:

- the householders have a powerful incentive to keep their facilities in optimum working order because they have invested and they benefit;
- they carry out repairs themselves;
- they finance all of the O&M costs;
- there are clear opportunities for small private sector local contractors; and
- improving the performance of O&M is not really an issue in the same way it is for either community groups or centralised institutions.

Household centred approaches suffer few of the problems of central and community based O&M management. Both the centralised and user group models for managing O&M have drawbacks. However, there are many situations where there is simply no effective institutional support of any sort, and communities and households manage things as best they can. The approach adopted here is firstly to find out about user perceptions of operation and maintenance and the actual performance of the municipality or line agency. We then look at strategies for managing operation and maintenance which combine the efforts of the municipality together with user groups.

Finding out about users perceptions

The opinions of the users of services and their level of satisfaction about the O&M of the existing levels of service provide important information about the operation of that service and provide an essential input to Action Plans. This is central to the whole concept of evaluating the performance of a service, whether it be managed centrally or by local user groups; nevertheless, there has traditionally been a surprising reluctance to find out and act on users' perceptions. It is essential to include the views of the urban poor as well as those in middle- and high-income areas of cities.

Tool 5 can be used to develop a good understanding of user perceptions of O&M. Tables 6.2 and 6.3 give examples of issues and findings in relation to O&M.

Table 6.2. Some important issues in relation to users perceptions

1. Which O&M activities are currently undertaken in slums/rural communities and by whom. In addition to activities carried out by statutory bodies, this includes any private arrangements made by the inhabitants, either undertaking work themselves or through contracting a third party.
2. What are the attitudes and perceptions amongst the users concerning roles and responsibilities for O&M. In particular:
 - what are the actual problems with O&M of services;
 - whose responsibility are these problems perceived to be;
 - is there evidence of facilities being cared for;
 - is there evidence of facilities being misused;
 - are there any mechanisms through which users can approach city institutions; if so what are they and how effectively do they work;
 - how have O&M problems been resolved, with particular reference to internal local initiatives;
 - what is the potential for promoting increased ownership and care of facilities through users becoming more proactive;
 - what are the possible routes and mechanisms which could help users to become more proactive.

Table 6.3. Some detailed findings about O&M using PRA tools

There are a number of positive general indicators which point to the fact that local people in the urban slums are prepared to care for their facilities and pay for upkeep and improvement.

- Undertaking minor repairs to handpumps.
- Collecting money for tubewell maintenance.
- In receipt of training for standpost repair.
- Replacement of standpost taps.
- Tiling of standpost apron.
- Contributions totalling Rs 300 per month to engage sweeper for communal latrine.
- Road sweeping in front of houses.
- Replacement of some street light bulbs.
- Community hall: cleaning, whitewashing; maintenance fee contributions.
- Maintenance of plantation area & sale of produce.
- Financing the construction of small temples and maintenance of an existing temple.

Instances of community members approaching the different statutory authorities are quite widespread, although with little evidence of successful outcomes. In general, there was no clear understanding of the division of institutional responsibilities. Approaches are made either directly, or to the local Councillor, or through NGOs. Misuse and lack of care for facilities is a problem in a number of the areas studied; there are a number of common problems.

- Blocked drains, caused by indiscriminate dumping of solid waste.
- Children defecating in open drains.
- Illegal power connections.
- There is one case of a conflict on water collection from a standpost, and another of appropriation of a handpump by an individual household.
- Latrines used for a variety of purposes, including lock-up storage and goat-keeping; one old lady in Khannagar, where a NGO constructed large latrines, 'uses it as her place of residence'.

This is followed up in Table 6.5. as part of strategy development for local action planning.

Finding out about municipal performance

Carrying out a ‘situation analysis’ of the way in which the municipality and other service providing agencies actually perform is the first stage in developing institutional development and capacity building plans to improve O&M. This complements the work which needs to be done to assess users perceptions. The objectives of the situation analysis are:

- to investigate the current status of O&M in the municipality and relevant line agencies; this includes both consideration of O&M aspects during planning and design of infrastructure, and relevant tasks carried out as part of the organisations’ O&M activities.
- to explore the financial and human resources, including levels and types of skills, available and allotted to these tasks.

The situation analysis needs to explore the following issues in detail

- Roles and responsibilities for O&M of different services
- Existence of infrastructure assets registers or surveys
- Analysis of sources of revenue including: own revenue through local taxation; loans from government agencies and private banks; grants from government agencies, national and international donors
- Analysis of expenditure: staff costs; capital works programmes; O&M by sector; debt servicing and outstanding debts
- How expenditure is allocated to different aspects of O&M work
- Details of any maintenance planning system, for example:
 - a) day to day operation;
 - b) corrective maintenance, in response to breakdowns;
 - c) periodic maintenance as part of a programmed approach to O&M carried out at intervals of greater than one year;
 - d) preventative maintenance to interrupt the deterioration process; and
 - e) routine maintenance of a preventative and/or corrective nature carried out one or more times each year.
- Existence of reporting systems for: tracking income and expenditure; forward financial planning; capital and O&M works planned and implemented; complaints/action registers, updating asset registers and mapping.

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- Allocation of staff by sector
- Management of work: tasks which are centrally managed and/or decentralised to Ward depots

One of the most useful ways of presenting information is to compile performance indicators; however, in many cases the quality of the management information is very poor and it can be surprisingly difficult to calculate meaningful indicators. Table 6.4 gives examples of financial performance indicators for water supply and sewerage.

This work needs to be carried out using a range of techniques. A good deal of information is found out by interviewing 'key informants' ranging from senior officials to financial book-keepers and work supervisors at the Ward Offices. This becomes particularly important where management information systems are poorly developed or totally lacking. It is then extremely difficult and time consuming to extract the necessary information as it is necessary to look at cash books and individual work and contract files.

Table 6.4. Examples of performance indicators for O&M of water and sewerage

Indicator	Components or data	Formula
1. Revenue collection efficiency	<ul style="list-style-type: none"> ■ Total amount billed for water or sewerage ■ Total collected (= total tariff revenue) 	Total collected divided by total billed
2. Billing efficiency	<ul style="list-style-type: none"> ■ Total number billed for water or sewerage ■ Total number of known water and sewerage connections required to pay charges 	Total billed divided by the number of connections required to pay
3. Informal water cost	<ul style="list-style-type: none"> ■ Amount paid to water vendors (including other households) for a standard volume of water in a locality 	Average amount paid to vendors divided by the local household tariff rate for an equal volume
4. Informal sanitation cost	<ul style="list-style-type: none"> ■ Amount paid for use of a public or private latrine 	Average amount paid annually per household
5. Operating costs per connection	<ul style="list-style-type: none"> ■ Total O&M cost for water or sewerage ■ Number of connections (includes individual and communal) 	O&M cost divided by the number of connections
6. Revenue per connection	<ul style="list-style-type: none"> ■ Total tariff revenue for water or sewerage ■ Number of connections (includes individual and communal) 	Tariff revenue divided by the number of connections
7. Cost-recovery ratio	<ul style="list-style-type: none"> ■ Total O&M costs for water or sewerage ■ Total tariff revenue ■ Total miscellaneous and subsidy income 	Total tariff revenue plus subsidies and miscellaneous income divided by the total O&M cost

Notes on Table 6.4

There are many different financial indicators available, and it is necessary to restrict the listing to those which are likely to be measurable in the context of government bodies whose accounting systems are not geared up to management accounting. In general, financial balance sheets are not always available and accessing the necessary information can be difficult.

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1. In urban water and sewerage systems, the efficiency of revenue collection is one of the most important indicators; many organizations simply do not collect the user charges from those to whom they send bills. Improving this indicator is one of the highest priorities for increasing revenue.
2. There are usually many unregistered connections for water and sewerage; the revenue net can be widened by checking up on properties which are identified under the land registration system but are not registered with the water/sewerage agency.
3. Users in peri-urban areas which are poorly served by the trunk supply may obtain drinking-water from informal water vendors (they include households with their own connection); the rates may be much higher than the prevailing tariff charged by the utility.
4. Where there are no household latrines, family members may pay to use either a public toilet or, in some cases, the toilet of a neighbour. Both indicators 3 and 4 are extremely important as they concern operational payments by poor households; this, in turn, indicates willingness to pay for the service and identifies opportunities for formal services to be extended to the poor.
5. A major problem in defining an operating cost indicator is that the recorded O&M expenditure does not necessarily reflect the expenditure required to operate and maintain the system; the result is a spiralling deterioration of the assets. The problem with the centralized approach is that a budgetary allocation may be made for each household or each community based on the expected income from user charges and subsidies; in other words, while 'the books balance', the actual demand for O&M is not met. Asset registers and infrastructure condition surveys are required to determine O&M requirements; until this is done, it may not be appropriate to plan for this indicator to reduce in value.
6. In centralized urban schemes, there are two common ways of collecting revenue. First, through a direct water tariff; secondly, through an indirect form of municipal taxation, e.g. where property tax payments may contain an item of charges for water supply and sewerage. A maintenance fund will normally be required in order to purchase spare parts, and the contributions in cash or in kind can be explored with the users.

Strategies for managing O&M

Improvements to existing operation and maintenance are amongst the hardest things to achieve; they are key components of action planning for networked infrastructure and are considered as part of:

- Local Action Plans at the neighbourhood level;
- Area Network Service Plans at the municipal Ward level; and
- coordination of the Area Network Service Plans at the town/city level.

Whatever can be managed at the household level is best dealt with in this way. One of the problems is that inadequate performance and lack of capacity at the municipal level often dictates that community or user groups need to become involved if significant improvements are to take place. The problem is that this is rarely, if ever, dealt with in a strategic way.

In this section we propose a move towards an O&M management strategy which brings together the most attractive features of municipal management and community management at the Ward level into a framework for *municipality-community partnering for O&M*. The difficulty arises in knowing where to draw the boundary between O&M carried out by a community or user groups and that carried out by the municipality or line agency. We need to consider how the best features of involving both community/user groups and the municipality can be matched together. Any strategy for operation and maintenance involving both the municipality and its citizens needs to be built around the following principles:

- clarity on roles and responsibilities;
- accountability of actions; and
- performance improvement.

These principles are considered in the following sections that focus on plans at the local neighbourhood and municipal Ward levels and which lead to a Memorandum of Understanding (MOU) between the different parties. The Ward Committee (or other consensus building mechanism at the Ward level, see Section 3c) plays the central role in defining a workable strategy and plan for improving O&M which leads to the Memorandum of Understanding.

Operation and maintenance in local action planning

Table 6.5 describes the detailed activities to be carried out at the neighbourhood level in order to produce the Memorandum of Understanding (MOU) for

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O&M between the community/user groups and the municipality. Note that O&M is complex in that a number of these activities at the local action planning level must also involve local municipal officials and politicians. The key point about the MOU is that it needs to be realistic. Whilst there is evidence that well motivated user groups maintain their services, it cannot be assumed to be generally the case that this will happen by default just because the municipality/line agency does not perform. This negotiation is one of the most important aspects of consensus building (see Section 3c).

Any discussions and decisions about the management of O&M has to be based around who agrees to do what. Therefore, it is essential to consider what tasks are actually involved with the O&M of different services and different technical options. These have been considered in some detail earlier in this manual; please consult the following for further guidance on the actual tasks involved.

Tool 6 *Technical Options* summarises some of the basic maintenance requirements of the different technical options in each service sector.

Tools W4, D4, P4, S6, L4 provide additional handy tips on O&M for water supply, drainage, paving, sanitation and security lighting.

Table 6.5. Developing a strategy for operation and maintenance in local action planning		
Activity	Description	By whom
Understanding operation and maintenance requirements	Present the operation and maintenance requirements of each technical option to service users during the discussions about service improvements and as part of any assessments of demand. The operation and maintenance implications of different infrastructure options and the likely extent of municipal involvement must be understood from the beginning	User groups NGOs Ward Committee
Explore user perceptions	Many of the actions for improving levels of service involve increased efforts in O&M. Explore users perceptions of the nature and frequency of activities which they believe to be necessary in order to achieve their desired level of service. This should include perceptions of their own capacity to become involved, working together with the municipality.	User groups NGOs

Table 6.5. (continued)

Activity	Description	By whom
Assess willingness to participate	Determine the willingness and capability of user groups both to perform tasks themselves and to pay for operation and maintenance in order to reach the desired level of service. Focus on user groups resourcing and managing simple activities like sweeping and cleaning of pathways and drains; more complex tasks and skilled training can follow. This also includes payment to the municipality and other line agencies for work to be carried out.	User groups NGOs
Make user group plans	The user groups make plans for their contributions to O&M including: <ul style="list-style-type: none"> ■ activities to be carried out; and ■ costs and financing which will be the basis for the Memorandum of Understanding with the municipality. User groups will be responsible for raising finance and/or human resources to undertake local activities to which they have agreed.	User groups NGOs Ward Committee
Ensure accountability checks are in place	The user groups are accountable to their members through the agreed actions and targets which are set out in the Memorandum of Understanding	User groups, NGOs

Operation and maintenance in networked services planning

The key activity is the agreement of Memorandums of Understanding with all of the neighbourhoods which are developing Local Action Plans. In addition to this there are a number of more detailed actions which are necessary in order to improve the basic management of operation and maintenance at the Ward level. The Ward Committee (or other consensus building mechanism at the Ward level, see Section 3c) has the central role in the whole process; see Table 6.6.

Table 6.6. Establishing roles and responsibilities through the Ward Committees

Action	Description
Prepare Memorandums of Understanding	<p>Negotiate the extent of the statutory responsibilities for O&M in a particular neighbourhood at the Ward Committee. The outcome of the negotiation is a Memorandum of Understanding (MOU) for operation and maintenance which specifies:</p> <ul style="list-style-type: none"> ■ who is responsible for what; and ■ the level of service to be provided (for example, frequency of attendance of sweepers and drain coolies). The level of service will vary from place to place depending upon the capacity at the Ward level.
Options for Implementation	<p>Discuss different options for executing these services at the Ward Committee; depending on the level of O&M service agreed to by the parties to the MOU:</p> <ul style="list-style-type: none"> ■ the Municipality/agency undertakes work in accordance with the MOU; ■ the Municipality/agency contracts community/user groups to undertake certain works; ■ community/user groups manage levels of service over and above those specified in the MOU, either by undertaking work themselves, or engaging others.

The next stage is to ensure that the Ward Area Network Service Plans for O&M are coordinated at the town/city level; see Table 3c.1 in Section 3c.

Improving municipal performance

As stated previously, improving the performance of the O&M functions of municipalities and line agencies is central to the whole strategy of action planning for improved service delivery. This section suggests possible approaches and activities to incorporate into wider institutional development activities to improve municipal performance.

- Table 6.7 suggest some strategic activities at the municipal level.
- Table 6.8 suggest some actions which can support O&M improvements at the Ward level.

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Table 6.7. Improving operation and maintenance at municipal level: some suggestions

Action	Description
Commitment to strategic planning for operation and maintenance	Prepare a strategic plan for implementing increased investment in O&M against specific budget lines for O&M on a year by year basis. This needs to take account of the O&M activities being developed at the Ward level as part of the Area Network Service Plans and is likely to require resources to be allocated from the centre to the Wards.
Clarify ownership of new assets	Define the statutory ownership of the assets created under the upgrading programme. Establish clear procedures for handover of O&M responsibilities to municipal departments or other line agencies which are compatible with the Memorandums of Understanding negotiated at the Ward level for neighbourhood Local Action Plans.
Review financial management	Review and improve financial management procedures to enable strategic planning of O&M to be carried out. This may involve establishing separate budget lines for O&M and setting up a management information system for financial reporting.
Plan the budget allocations	O&M activities carried out under the annual plans are financed by setting aside the agreed proportion of total revenue to be operated through the budget lines for O&M.
Update the tax base	Households in improved areas are included on the list of registered holdings and are liable for municipal property tax in accordance with the financial rules in force at the time.
Define what tools are needed	The basic tools for setting priorities for the O&M planning process are derived from Ward level asset registers, simple infrastructure condition surveys, and qualitative user satisfaction surveys. The crucial link here is with improved financial management and reporting, which is a prerequisite for setting a realistic budget for O&M.
Develop performance reporting system	Develop another component of the management information system to report on the performance of engineering works. This could include a register of works undertaken in a budget period, classified into capital and O&M, with a one-line description, the estimated cost, the accepted tender price (if applicable) and the completion cost . Link these works to the infrastructure asset registers which are held at the Ward Office (see above).

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Table 6.7. (continued)

Action	Description
Performance monitoring	Annual <i>city report cards</i> which describe how well the city has performed have been successfully used in some places. The key elements of this are a qualitative survey of user satisfaction, and the institutional performance indicators prepared using information from the physical and financial reporting system outlined above. Prizes could be offered both to the best Ward and the best neighbourhood group for operation and maintenance.
Review human resource needs	Review the existing deployment of staff and how they can best be deployed in order to deliver the improvements to O&M contained in the Area Network Service Plans. This may involve greater decentralisation to the Ward level.
Review training needs	Re-deployment of staff will require additional training to enable staff to take on a wider variety of roles. The training needs assessment uses the Action Plans as the basis for reviewing the skills requirements.
Review procurement methods	Investigate ways in which the current methods of procuring services can be diversified. In particular, pilot-test the use of term contracts for regular works. Examples could include bitumen transport, repair of major roads and solid waste collection.

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Table 6.8. Actions to support operation and maintenance improvements at the Ward level

Action	Description
Establish a Ward complaints register	The Corporation Ward is the focus for O&M activities, performance reporting and monitoring. The Ward complaints register provides the mechanism for reporting problems in relation to the services agreed in the Memorandum of Understanding. It needs to be fully maintained with a record of the date and nature of all complaints, when and how they were dealt with.
Audit of complaints register	Prepare periodic summaries for inspection and audit. The register needs to be audited annually to review response and performance in relation to action on complaints related to the Memorandums of Understanding.
Maintain infrastructure asset registers	This builds on Activity 2 <i>Find out what is there</i> in the Framework for networked services planning in Section 3b. Having identified and mapped existing services, it is essential to keep the records updated so that O&M needs can be readily identified.
Performance monitoring	One of the major problems in municipal O&M activities is that there is no monitoring of how staff perform. That is, inputs in terms of number of staff and allocation of budgets are monitored, but outputs such as what staff do and achieve are rarely evaluated. Investigate how to introduce pilot performance monitoring schemes for routine operational activities for staff such as drain coolies and solid waste sweepers working out of the Ward office. The monitoring could be carried out largely by residents and reported via the Ward Committee or Ward Forum. Note that there is likely to be a lot of resistance to this from those who are being monitored; however, if things are to improve it has to be tackled.
Maintain work registers	A work register which classifies works carried out as either capital or recurrent needs to be maintained at the Ward Office. Periodic (monthly/quarterly) summaries need to be sent to the central municipal office.