

REPUBLIC OF SOUTH AFRICA

**Water Quality Management
Series**

**Managing the Water Quality
Effects of Settlements: -**

**A GUIDE TO
PROBLEM ANALYSIS**



Department of Water Affairs and Forestry

NOVEMBER 2001

**Water Quality
Management Series**

MANAGING THE WATER QUALITY EFFECTS OF SETTLEMENTS:-

**A GUIDE TO
PROBLEM ANALYSIS**

Department of Water Affairs and Forestry

NOVEMBER 2001

DOCUMENT INDEX

This document forms part of the Department of Water Affairs and Forestry's National Strategy for Managing the Water Quality Effects of Settlements. It represents one of the outputs of a project that was jointly funded by the Department of Water Affairs and Forestry and the Danish Government via their DANCED program.

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PREFACE

Pollution from densely populated and poorly serviced settlements is perhaps one of South Africa's most *important*, but most *complex* water quality problems.

Important, because pollution in and from these settlements not only affects downstream users, but has its most significant impacts on the communities living in these settlements. Failing sanitation and waste removal systems create appalling living conditions in many settlements, and contribute to serious health problems in these communities. Pollution in and from these settlements is, therefore, not only a water quality issue, but has much wider implications for government's aims to provide a better life for all

Complex, because pollution in settlements is rooted in the socio-economic, political and institutional conditions in the settlement. The use, or misuse, of services together with the way in which the services are maintained by Local Authorities lies at the heart of the pollution problem in many settlements. This is further complicated by the legacy of South Africa's apartheid history. Solutions, therefore, lie in changing the way in which the services are supplied and used.

However, *sustainable* solutions to the problem lie not only in our ability to supply and use waste and sanitation services to best effect, but also in the longer-term capacity of local government to maintain these services. This is likely to be the biggest stumbling block to sustainable management of pollution from settlements. Local government in South Africa clearly has significant capacity problems, and misuse of services, for a variety of reasons, is endemic in many settlements across the country. More importantly, failing waste services contribute to poor living conditions, and hence to the misuse of the services. Non-payment for services also limits the capacity of the Local Authority to effectively maintain the services, which then leads to further failure of the services.

Strategies to manage pollution in settlements must take a broader view of both Local Authority capacity, and the socio-economic and political dynamics of the community in order to arrest this downward spiral. The Department of Water Affairs and Forestry, therefore, initiated a study of the links between pollution, community perceptions and local government capacity, to run in parallel with the Test Cases. A number of reports have been produced to support this study.

It is hoped that these reports provide compelling arguments to address this problem both by ensuring better planned and run services, but also by active intervention and assistance where there are clear and immediate threats to community health and the environment. This report forms part of this process.

EXECUTIVE SUMMARY

Introduction

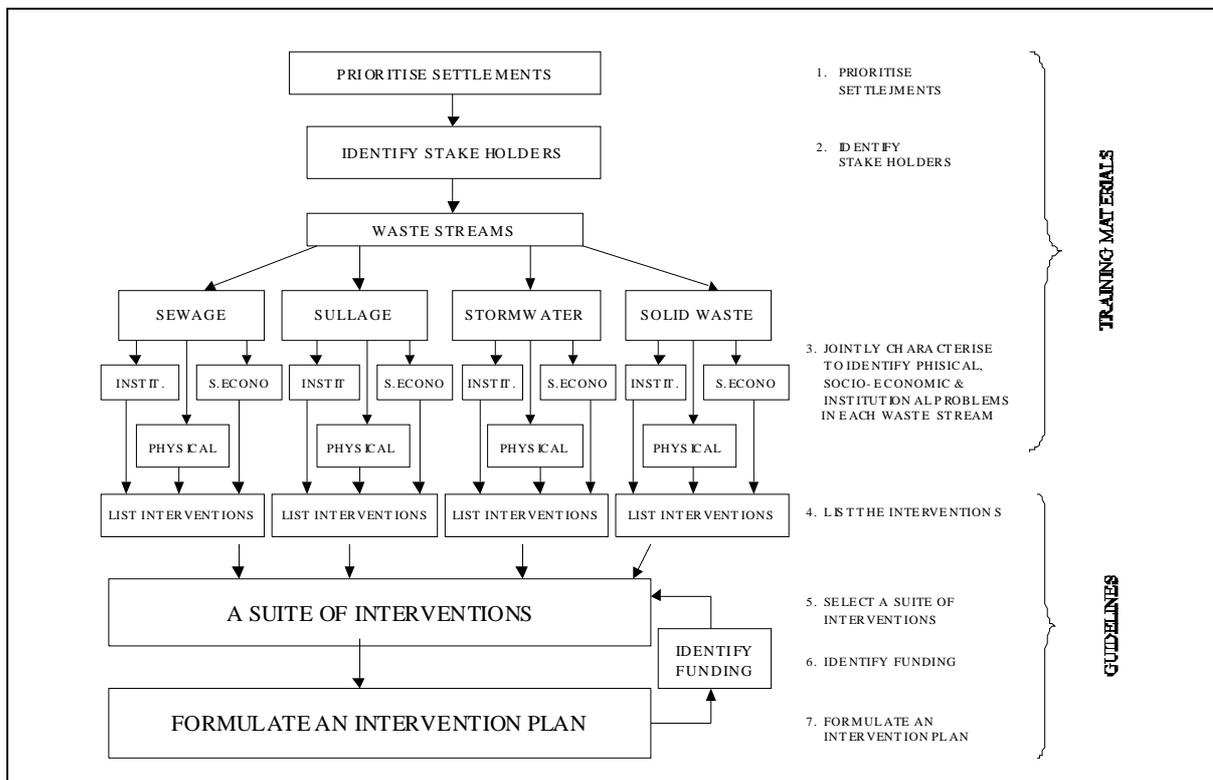
The Department of Water Affairs and Forestry has the mandate to manage the quality of South Africa’s water resources. Human settlements, particularly the more densely populated areas, are a major source of water quality contamination. Managing the water quality problems associated with these settlements is a complex task, and the Department has consequently developed a strategy to manage the water quality effects of these settlements.

This strategy is based on finding the appropriate balance between the amount of waste produced in the settlement, the services in place to manage the waste and the impacts on the water environment. This balance is found by a “structured facilitated” dialogue between stakeholders, which aims to identify the underlying causes of pollution in the settlement. Interventions that address these underlying causes are then proposed.

About this guide

The “structured-facilitated” process of identifying and addressing the causes of pollution is outlined in the Figure below. This document provides a detailed guide on how use this process. It is aimed at DWAF or Catchment Management Agency personnel, Local Authority staff, service providers and community representatives that may be involved in trying to analyse the root causes of the pollution problem (i.e. the problem analysis).

Diagram 1: Schematic representation of the structured facilitated process.



The output of this process is a problem tree, which provides the basis for identifying and selecting a suite of appropriate interventions. These are then included in an Intervention Plan for a settlement.

The structure of this guide

- ◆ **Chapter 2** outlines the approach to prioritising settlements
- ◆ **Chapter 3** outlines a process of problem identification. This is divided into two components. The first is related to the participative identification of problems through, while the second aims at establishing their underlying causes.
- ◆ **Chapter 4** sets out a step-by-step process to develop a problem tree, based on the information derived from the problem identification process.
- ◆ **Chapter 5** makes suggestions for the identification of potential solutions to the root causes of problems as input into the selection of interventions
- ◆ **Chapter 6** provides guidelines for the development of appropriate monitoring and evaluation systems and makes suggestions for the development of Key Performance Indicators.
- ◆ **Chapter 7** provides information as a bridge to using the Options for Interventions.

Note

The approach adopted in writing this document was that the problems are too complex to provide simple answers. Rather, the document attempts to instil an understanding of the linkage between problems and causes and follows a procedure to highlight critical issues to help you do the problem identification and find root causes of problems. Possible generic causes are presented for different types of problems, but these should always be evaluated against the site-specific conditions in a settlement.

Used in this way this document should provide a tool to support the identification of problems in a settlement as the first steps towards supporting the selection and implementation of appropriate interventions to protect the quality of water resources in and downstream of human settlements.

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CHAPTER 1: INTRODUCTION AND BACKGROUND

1 Background

DWAF has outlined a [National Strategy](#) to manage the water quality effects of settlements. The aim of this National Strategy is to:

1. Outline DWAF's policy for managing pollution from densely populated areas, and
2. Describe a process of trying to identify the actual causes of pollution in such settlements
3. Describe the roll out of this process in priority settlements.

This entails trying to maintain a balance between:

- The sensitivity of the receiving water resources.
- The amount of waste produced in terms of the size and density of a settlement.
- The level and operation of services in a settlement.
- Financial sustainability.

(It is recommended that you familiarise yourself with the National Strategy prior to working through this document.)

2 The aim of this guide

The National Strategy document describes *what* the Department of Water Affairs and Forestry (DWAF) will be doing to ensure that priority settlements are addressed on an ongoing basis. As part of this roll out, stakeholders will use a “structured-facilitated” way of doing a problem analysis. This guide provides a detailed description on *how* to do this problem analysis using this approach.

The guide is intended to help DWAF, Catchment Management Agency, Local Authority staff, or communities undertake the structured facilitated process in any settlement. However, the step-by-step processes these groups should follow are outlined in the following supporting guides:-

- ◆ How to implement the Strategy – [A Guide for water quality management staff](#)
- ◆ How to implement the Strategy – [A Guide for Local Authority staff](#)
- ◆ How to implement the Strategy – [A Guide for Communities and NGOs](#)

These guides are supported by a number of other detailed guides to help you in the process. These are:-

- ◆ How to implement the National Strategy.
[Intervention Options. Operational Guideline U 1.2](#)
(This document presents alternative options for addressing pollution problems)
- ◆ [A Guide to Stakeholder Identification.](#)
(This document provides a detailed guide on how to select stakeholders.)
- ◆ [A Guide to holding workshops](#)
(This document provides some advice on how to hold a workshop)
- ◆ [Working Towards a Clean and Healthy Community](#)
(This is an information booklet available in English, isiZulu, seSotho and Afrikaans, which helps stakeholders participate in a meaningful way.)

3 What steps should you follow when doing a problem analysis?

A problem analysis is a site-specific process that follows these steps:

Step One: Prioritising the settlements in the region that need attention.

Step Two: Identifying and involving all stakeholders ([See the Stakeholder Guide](#)).

Step Three: Answering the following questions:

- What are the existing water quality problems in the area?
- What problems are likely to occur in the future?
- Which waste streams are causing these problems?
- What are the physical, social and institutional factors contributing to problems in these waste streams?

Step Four: Preparing findings in a Problem Tree.

Step Five: Listing all possible interventions that address the root causes of problems in each waste stream as outlined in the problem tree.

Step Six: Selecting a suite of interventions best suited to the settlement and the specific problem.

Step Seven: Developing an intervention plan that outlines a structured way of implementing these interventions.

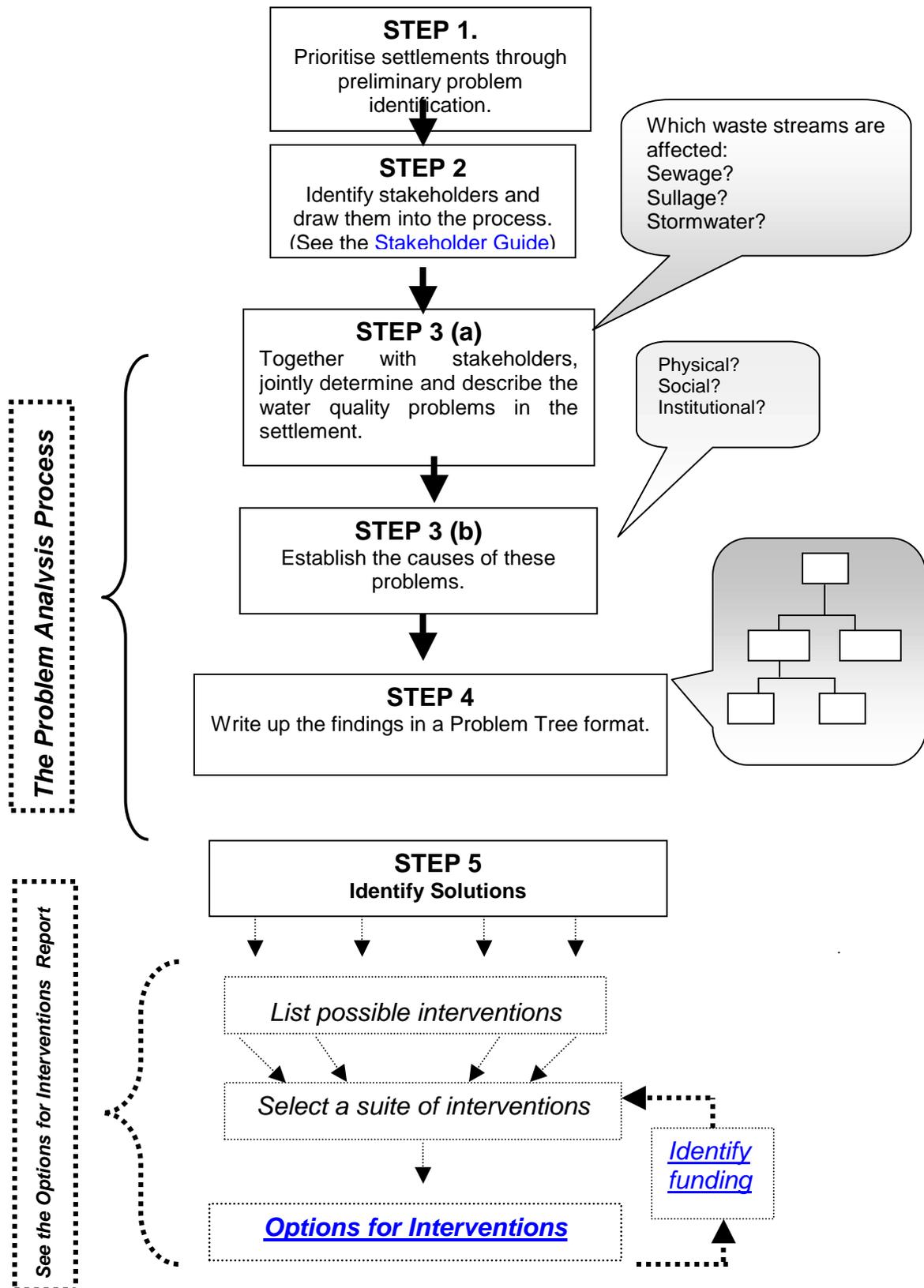
Step Eight: Determining how to fund the interventions.

Step Nine: Modifying the Intervention Plan if necessary to ensure that the interventions are financially viable and sustainable.

These steps are outlined in the road map overleaf. This roadmap will guide you through this document.

Diagram 2: Roadmap of

Steps in Problem Analysis



4 Who should take the lead in the process?

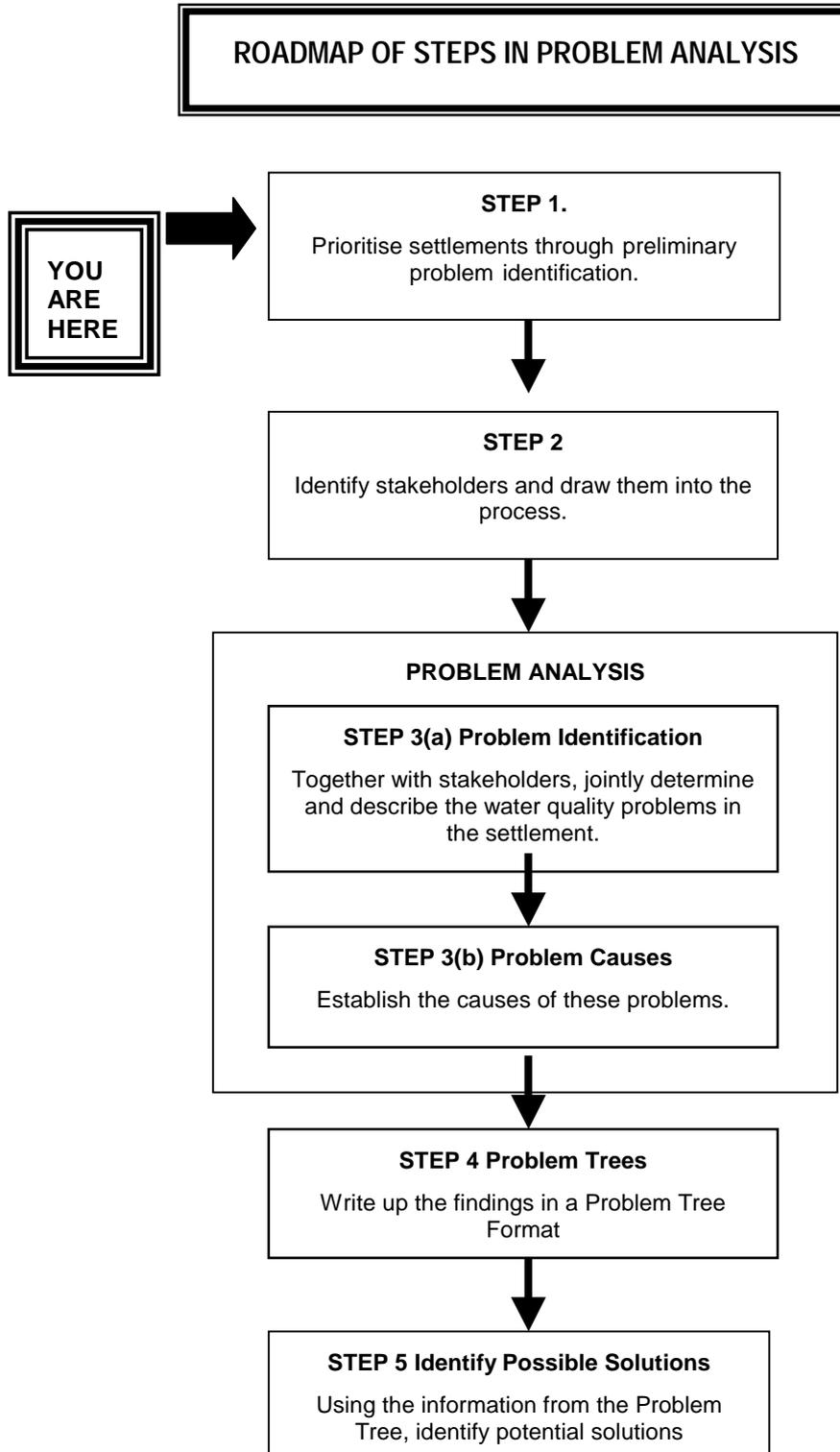
A representative from the Regional Department of Water Affairs and Forestry (DWAF) will usually be the person who identifies water quality problems, or who is notified of the existence of such problems should there be an emergency situation. For this reason one or more persons from DWAF at Regional level will usually be involved in the process.

But DWAF will then engage the appropriate Local Authority with a request to address the problem, but, DWAF will facilitate the process of identifying the root causes of the problems and appropriate solutions to these. (Local Authorities will be responsible for ensuring that these are implemented as part of their day-to-day activities.) The [Guidelines for Water Quality Staff](#) outline how this will be done.

However, Local Authorities may also wish to use the process to help them address the pollution problem, and to help them provide better services. This could also help them prepare their Water Services Development Plans (WSDP). Similarly, communities or NGOs may want to take the lead to that they can create better living conditions, or so that they could address health problems associated with pollution in their settlement.

All these groups would use the approaches outlined in this Guide to do the problem analysis.

CHAPTER 2: PRIORITISING SETTLEMENTS



1 Prioritising settlements

To prioritise settlements, you need to do a preliminary problem identification. Priority should be given to settlements where you know the settlement is causing water quality problems, or where the waste services are clearly failing or where there are significant health problems associated with pollution. The process for doing this is described below.

2 Why should you prioritise?

For the following reasons:

- To ensure that you focus your time and resources on settlements where you will have the biggest impact. Attention should be given to those settlements that could have a regional impact on water quality, or where a larger population is affected by the pollution.
- To choose settlements in which your interventions are likely to meet with success.
- To ensure that when projects are identified they are not only prioritised because of water quality problems, but also because assistance may positively impact on the quality of life in the settlement.
- To ensure that limited government finances are spent wisely. Remember that money spent must help achieve the wider goals of government.

3 What should prioritising achieve?

- A list of settlements that you should start tackling in order of priority.
- A balance between the need for protecting water resources, encouraging better planning and use of land and making sure that water services are reliable.

4 How do you prioritise?

Priorities are determined by considering all the aspects that may exacerbate water quality problems from settlements. But priorities are also influenced by wider planning initiatives, such as:

- Local and Provincial Integrated Development Plans.
- Local Authority Land Development Objectives.
- Local Authority Storm Water Master Plans.
- Local Authority Water Services Development Plans.
- Provincial Environment Departments' General Waste Management Plans.
- Catchment Management Strategies.



TOOLS & TIPS

Prioritising should be carefully planned, and should help you avoid emergency situations like widespread cholera outbreaks or significant health problems. That is: Act before a crisis becomes a crisis.

5 Tips for prioritising settlements

a) List settlements in your region

List all the settlements in your region that may be experiencing problems, grouping the settlements that are close together. This will help you see how widespread the problem is, but will also help you to link settlements together so that combine nearby settlements with similar problems.



TOOLS AND TIPS

Combining priority settlements with less important settlements nearby

Efficient use of time and effective use of resources is crucial. Once your priority areas are outlined according to regional and local boundaries, you may want to consider dealing with some less important settlements at the same time, if they are close by. (You would need to consider whether or not combining would limit your resources for the priority settlements.)

b) Estimate residential density per hectare

The larger more densely populated settlements are more prone to pollution problems as they produce more waste in a smaller area. A general rule of thumb is to prioritise settlements over 35 houses per hectare, and over 1000 houses. The following tips will help you estimate the size and density of the settlements

- Ask the Local Authority for settlement density information, and for the number of houses in the settlement.
- Use census data to provide the number of households per settlement and settlement size. To get the density per hectare, divide the number of households by the size of the settlement.
- Use the pictures provided on the CD to estimate the density of your settlement.

c) Consider the following issues

- ❖ Is there potential for unplanned growth in the settlement?
- ❖ Does the Local Authority/Service Provider have capacity?
- ❖ Is the Local Authority experiencing financial difficulty?
- ❖ Are there high levels of service that are poorly maintained?
- ❖ Is cost recovery low?
- ❖ Are there unacceptable water quality impacts?
- ❖ Are there significant health problems?
- ❖ Are there visible signs of pollution?

d) Do a Preliminary Problem Identification

A preliminary problem identification helps you prioritise by giving you an idea of what is causing the problem, and how easily these could be addressed. A preliminary problem identification also provides a point of departure for the more detailed problem analysis that is done later in the process.

The most important background information you will need for the preliminary problem identification is [Section 3 – The causes of pollution from settlements](#) of the National Strategy document. This will help you understand the generic causes of pollution. The following tips will help you get a better idea of what is causing the problems in your settlement:

- Are the services appropriate for the size and density of the settlement? The larger and denser settlements require higher levels of services and better-run services. But it is more important that the services are financially sustainable. (See [Table 1 in the report on Planning to Avoid pollution from settlements](#))
- Are the services appropriate for the average income of the householders, or the finances of the Local Authority? (Some Local Authorities may have problems because they cannot recover the costs of the services from consumers)

These two issues will tell you if the problems may be due to the type of services that are supplied. This will highlight how important the physical causes of pollution are. But remember these physical causes are almost invariably underlain by social and institutional causes.

- Talk to people in the community about what they think is causing the problems, particularly where they think the services are not maintained properly. This will tell you what the institutional problems may be.
- Talk to the Local Authority staff and ask them how the community looks after the services, and whether they pay for services. This will give you an idea of the social causes of pollution.
- Do a site visit to look for “tell-tale” features in the settlement, which could be causing water quality problems. Things you would look out for are erosion gullies, continual dry weather runoff, overflowing sewers or uncollected litter, broken pit latrines, etc.



TOOLS AND TIPS

Preliminary Problem Identification

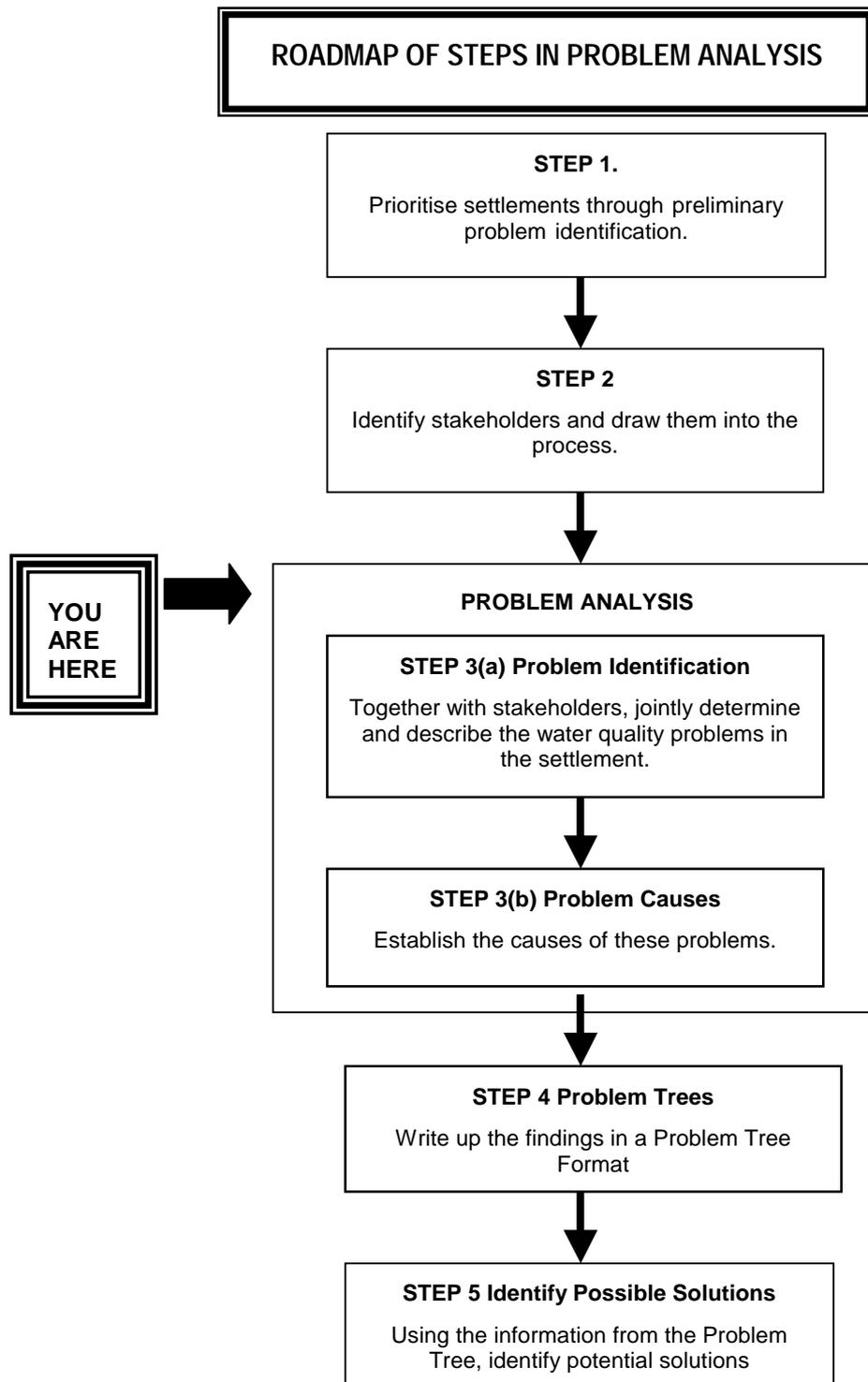
In the prioritisation stage, you do not need to do a thorough problem identification and analysis of the problems. It would be too costly to do this for every settlement under consideration.

You would do preliminary site visits to get a sense of what the effects and symptoms are of water quality problems in the area. Here you would focus on the receiving water resource. You would also briefly survey the settlement itself to get a sense of what might be causing the problems.

6 What do you do with the information now?

Once you have prioritised the settlements in your area you will need to start addressing their pollution problems in more detail. The information you have gathered for the preliminary problem analysis will then form the basis for the more detailed problem analysis when you start work in the priority settlements. The more detailed problem analysis explores the physical, social, economic and institutional causes of pollution in greater depth, which then leads to the formulation of the problem tree and the identification of possible interventions (solutions).

CHAPTER 3: DOING A PROBLEM ANALYSIS



You have now prioritised settlements with pollution problems. You should also have identified stakeholders based on the preliminary problem analysis and the information contained in the Guide to Identifying Stakeholders. These stakeholders should all be involved in the detailed problem analysis.



TOOLS & TIPS

Be careful to firstly only identify the problems THEN their causes. The MOST APPROPRIATE solutions can only be identified AFTER you are sure what the real problems are and you have developed a PROBLEM TREE!

This Chapter is divided into 2 parts:

- ◆ What the Water Quality Management **PROBLEMS** are; based on the **SYMPTOMS** and
- ◆ What the **CAUSES** of these problems are.

The output of this process is a detailed understanding of the problems and their causes. This information will form the basis for the development of a Problem Tree as set out in Chapter 4.



TOOLS & TIPS

The difference between Symptoms and Causes

Symptoms are the outward signs or manifestations that indicate that there is a problem. Symptoms are the effects of the problem.

Causes are the roots or the source of the problem that is giving rise to the symptoms. The cause indicates the reasons for the problem. Very often the thing causing a particular symptom is itself a symptom of another cause. What this means is that you cannot stop investigating after uncovering the first level of causes. You have to keep probing deeper and deeper and asking questions like “Why did this happen?” Eventually you will start arriving at the root causes of the problem.

For example: Diarrhoea is a **symptom** of a problem. This symptom needs to be investigated to establish the causes. You may find that the **cause** of the diarrhoea is that people eat contaminated food without first washing it. But the **cause** of contamination of food is the insects that breed in the solid waste left behind in the settlement. The **cause** of solid waste being left behind could be that the waste trucks can't move through the narrow streets.

SECTION A: DETERMINING THE PROBLEMS AND SYMPTOMS

1 What is the purpose of doing a problem analysis?

We do a problem analysis, together with the appropriate stakeholders, to:

- Identify and describe exactly what the pollution problems in a particular settlement are.
- Identify what is causing these problems (the root causes).
- Identify the relationships between problems and their causes.
- Demonstrate the linkages between the physical, social and institutional problems.
- Prioritise each of the waste streams in terms of perceived impact.



TOOLS & TIPS

The reason for doing this is so that we can make sure that we identify, select and implement the interventions that take account of all these elements and which address the root causes of the problem.

2 Jointly determine water quality problems

a) What you have to find out:

- What are the existing or expected pollution problems?
- Which waste streams are associated with the problems?



TOOLS & TIPS

You find the relevant information by using the following processes:

- Desk-top research
- Structured facilitation/ consultation
- Surveying
- Sampling
- Asking guideline questions

3 Suggested Process to Determine Pollution Problems

Consult with a small group of stakeholders to get an idea of the causes of the problems. This will help you structure and facilitate the workshops with a wider group of stakeholders. (See steps below.)



Identify what problems are associated with each of the waste streams. Use checklists to help you facilitate this. (See suggested steps in the process to identify problems.)



Write up your findings as you go along in a form that can usefully be transferred to a Problem Tree. (See Chapter 4 on developing problem trees.)



Once the problems in the waste streams have been identified, ask the meeting to prioritise the 10 most pressing problems out of all the waste streams



For each of these prioritised problems, you now have to establish the possible causes with a wider group of stakeholders. Please refer to Section B on how to establish possible causes for problems

4 What do you have to know to identify problems?

a) What are the main kinds of pollution that affect the water environment?

- **Solid waste**, such as litter dropped in the streets, or household refuse that is thrown into the street or river.
- **Sewage waste**, which comes from leaking toilets or pit latrines, or broken or blocked sewerage pipes.
- **Sullage or grey water**, which is caused when dirty washing water is thrown into streets and washed into nearby rivers when it rains, or when grey water is thrown directly into rivers.
- **Storm water**, which is rainwater that washes soil, litter and other waste into the river.

These kinds of pollution are also known as waste streams

b) What are the water quality consequences of these kinds of pollution?

Table 1: Water Quality Consequences

Water quality problem	What is it and why is it a problem?	Which waste stream does it affect? ¹
Microbiological contamination	<p>What is it?</p> <p>Pathogens or germs from faecal waste or dirty washing water contaminate surface or ground water. This occurs generally as a result of inadequate water supply; insufficient sullage drainage; poor sanitation and/ or direct contamination of water by humans, animals or livestock.</p> <p>Why is it a problem?</p> <p>There are severe health implications for users who rely directly on contaminated surface or ground water. The main health effect is gastrointestinal diseases.</p>	<p>Sewage</p> <p>Sullage</p> <p>Solid Waste</p> <p>Storm water</p>
Nutrients and organic matter	<p>What is it?</p> <p>This is mainly phosphorus and nitrogen that comes mostly from human excreta and grey water, but may also be present in high concentrations in the stormwater runoff. It is caused mainly as a result of inadequate water supply, poor sullage drainage and sanitation, and poorly managed storm water washoff. These nutrients accumulate in surface and ground water and cause algal growth and contamination.</p> <p>Why is it a problem?</p> <p>This mainly increases the costs of treating water to potable standards. Downstream use of water for recreation may also be affected, harming health and the local economy.</p>	<p>Sewage</p> <p>Sullage</p> <p>Storm water</p>
Solid Waste or Litter	<p>What is it?</p> <p>Inadequate solid waste management and storm water management causes litter from public spaces and from household refuse.</p> <p>Why is it a problem?</p> <p>Causes degradation of aquatic habitat (i.e. places where the river animals live and breed). This also causes aesthetic problems in surface water bodies and tourists may not want to visit. It also contributes to the failure of storm water and sanitation systems, and worsens pollution</p>	<p>Solid Waste</p> <p>Storm water</p>

¹The waste streams affected most severely by the water quality problem are presented first.

Water quality problem	What is it and why is it a problem?	Which waste stream does it affect?¹
	problems in those waste streams.	
Sediment	<p>What is it? Sediment is sand and soil that comes mainly from storm water washoff from unpaved, over-grazed or poorly vegetated areas.</p> <p>Why is it a problem? It accumulates in rivers and dams affecting aquatic habitats, water treatment and reducing water storage capacity.</p> <p>Soil particles also provide a delivery mechanism for absorbed substances that can worsen other problems such as pathogen and nutrient contamination.</p>	Storm water
Destruction of the habitat	<p>What is it? It is caused mainly by building in the riparian (river-bank) zone, but can also be caused by human and animal activity.</p> <p>Why is it a problem? It affects the natural functioning of river ecosystems and allows waste to get into the rivers. Degraded habitats also add to other water quality problems by reducing the environment's natural ability to deal with contaminants.</p>	Storm water Riparian (river-bed) activity ²

5 How do you find out what the pollution problems are?

You must do a more detailed problem analysis to find the root causes of pollution in the settlement. The following paragraphs make some suggestions on how you can do this. Please remember that these are only suggestions:

a) Consulting stakeholders through a Working Committee (WC)

The reason for consulting stakeholders is that they are essential in identifying and understanding the causes of pollution. By consulting stakeholders using the “structured facilitated process” you will get local anecdotal evidence that indicates how the community members perceive the causes of pollution. They will also have an opportunity to express their concerns.

² Although riparian activity is not strictly a waste stream, it is a major cause of habitat destruction

The greater the involvement of the community through representation at Working Committee meetings, the greater the chances of successfully addressing the problems.

b) Consulting Stakeholders through Questionnaires/Interviews

Questionnaires and interviews serve as a structured way of communicating with people and getting information from them. The preliminary problem identification will provide the information need to design questionnaires to allow you to obtain very specific information from people that will increase your understanding of the specific problems as well as their causes.

Questionnaires are also very important to establish the baseline conditions, which will be useful when you start monitoring the success of your interventions. For example you may find that only a small percentage of the know where to report sewer blockages – your intervention would be to build awareness in this regard. You could test the impact of the awareness campaign by looking to see if there has been any improvement. (See the Chapter on Monitoring). The [Burlington Halt Test Case](#) has also made good use of questionnaires and social data to measure their success.



TOOLS & TIPS

UNDERTAKING INTERVIEWS AND QUESTIONNAIRE-BASED SURVEYS

- Try to establish a friendly and comfortable atmosphere between yourself and the person being interviewed or surveyed (respondent). Do this by being courteous, friendly, well groomed and low-keyed.
- Provide a brief but interesting description of the project as well as your reasons for requiring the information. It is important that they understand why you need the information, and what it will be used for.
- Remember to remain neutral and not to prompt the respondent or give the impression that you require a specific answer. Respondents will, at times, attempt to give you the type of answer they think you want to hear. Make it clear that you would like to understand how **they** see/feel/think about an issue.
- Avoid giving the impression that **you** will be solving their problems. Indicate clearly that you are facilitating a participative process.
- Try to ensure that you keep the interview or the questionnaire-based survey as standard as possible. This means that you must keep to a standard schedule of questions for all respondents. Also ensure that the main flow of information is from the respondent to the interviewer.
- At the end of the interview, thank the respondent for being willing to give his/her time and effort to assist you in your task.

Questionnaires have the advantage of allowing one to obtain information from a large number of people within a short period of time. It allows one to obtain information to the same set of questions from representative samples of different groups of people. The advantage of this is that one can say - with

a fair degree of accuracy – what the differences and/or similarities are in the knowledge, perceptions and attitudes of groups.

Interviews take significantly more time (and therefore cost more) than questionnaires do. Despite this, there are a number of advantages of using interviews that may outweigh the specific cost and time disadvantages.

The type of explorative questioning that is most effective in discovering root causes of water quality problems is an example of this. The interview situation easily lends itself to asking the question “why”. This exploring (or probing) through asking “why” is a key factor in discovering what the inter-relationship between problems and their causes are.

c) Consulting Stakeholders through a Workshop Process

(Step 1) Explain the purpose of the exercise: i.e. to find out what the problems are that stakeholders are experiencing with regard to water quality. What you are looking for are the visible effects or symptoms of pollution. Also explain that you will, at first, concentrate on identifying the problems

(Step 2) Before you ask participants to do the exercise, they need to understand what the different types of pollution are that affect water. Remind them what is meant by solid waste, sewage waste, sullage or grey water and storm water drainage. Use the [Awareness Material](#) to help you as well as the information under Sections 4 a and b (Table 4). This specific approach works better in a small group (such as the Working Committee) than in large gatherings (such as a community meeting).

(Step 3) Make the point that when participants are thinking about the problems, they should think about problems that relate to all the different waste streams. However, emphasise that you will only deal with one waste stream at a time.

(Step 4) Divide the group up into smaller groups of not more than 5 per group.

(Step 5) Hand out a pile of blank index cards and koki's to one person from each group.

(Step 6) Explain that each group needs to think about all of the problems that the stakeholders are experiencing as a result of its water being polluted. They should not worry too much at this stage about what is causing the problems – you will be getting to that later. Now they should focus on how they know there is pollution. What are the outward, visible signs and symptoms of this? Remind them to focus on one waste stream at a time when they think about the question.

(Step 7) Each group should write up every pollution problem that they have noticed in the settlement, on separate cards.

(Step 8) Circulate to all the groups and give assistance by asking questions that lead them to see the physical problems. The table below provides you with some guideline questions to help the groups to identify problems:

(Step 9) Reconvene the group.

(Step 10) Pool all the index cards.

(Step 11) Spread all the cards out on the floor, and get everyone to stand around the cards.

(Step 12) Discard the duplicates and consolidate points that are closely linked.

(Step 13) Try and separate out cards that describe the symptoms of the problem from cards that are already starting to get to the causes.

(Step 14) Through facilitation, get the group to prioritise 5 – 10 of the most important problems. That is, those that are most pressing or those that have the greatest impact on the community.

(Step 15) Paste the prioritised problems on the wall or on a board on the floor or on a table. (This will form the starting branches of your problem tree See guidelines for the problem tree below.)

(Step 16) Keep the non-prioritised cards to one side, as you will return to them later in the process.



TOOLS & TIPS

Remember – it is **very** important to ensure that **all** stakeholders, including representatives of all relevant sections of the organisation(s) that provide the service, are present when identifying both the problems and the causes. This means that a joint workshop will need to be held with the Local Authority, service providers and community representatives.

Why?

Each set of stakeholders has specific knowledge and understanding that will help clarify the reasons (causes) for identified problems that will prove vital for accurate problem analysis. The Local Authority may, for example, be able to identify causes that the community does not know about and visa-versa. This also helps the stakeholders recognise each other's problems as part of the problem analysis process.

6 How do you identify problems associated with the waste streams?

You will have some idea of the pollution problems from the previous steps. The aim now, is to flesh this out in a lot more detail. This is so that all stakeholders are clear on what the symptoms or effects are of water quality problems in their respective settlements in the first instance and what the causes are of the problems in the second instance.

The following table can provide guidance on how to determine the type of pollution problem.

Table 2 : Water Quality Problems

Type of problem	Questions to determine type of problem
Solid Waste	<ul style="list-style-type: none"> • Do people throw litter into the streets and into open plots? • Are there rubbish-bins? • Is there on-site disposal of waste? • Is there communal collection and formal disposal of household refuse? • Is there frequent and reliable formal collection & disposal to landfill?
Sanitation	<ul style="list-style-type: none"> • Are people using the bush as a toilet? • Is on-site sanitation adequate? • Is there off-site sanitation? • Is the sanitation system regularly maintained? • Are sewer blockages rectified in good time? • Are there large volumes of raw sewage flowing untreated into nearby streams? • Do children play near any areas where there is raw sewage?
Sullage	<ul style="list-style-type: none"> • Are there on-site soak-ways? • Are there communal standpipes with no soak-ways? • Are there large volumes of sullage flowing in the streets? • Are there in-house connections? • Are there yard connections? • Is there off-site sanitation?
Storm Water	<ul style="list-style-type: none"> • Is there any construction activity (settlements and infrastructure) particularly in the riparian zone? • Is there crop cultivation taking place, particularly in the riparian zone? • Are there backyard industries, which dispose of various wastes into the storm water or sanitation? • Are there steep slopes? • What sort of soil is there in the settlement?



TOOLS & TIPS

We have suggested what approaches and methods might be useful for the problem analysis. However, you will need to choose the most appropriate methods to achieve this. That is, once you become familiar with the processes and how to get the information you want, you will start to develop your own way of doing things.

SECTION B: DETERMINE CAUSES OF POLLUTION PROBLEMS



This is the most important part of the whole problem analysis, and you must make sure that you at least go through this process every time you start to address the causes of pollution in your settlements.

1 Suggested process to determine causes of water quality problems

Having prioritised the problems, you now have to establish the possible causes. That is, are they physical, institutional or social causes, and how are they linked? You do this by asking “Why?”



Once you have established the possible causes of all the prioritised areas, then you go back to the problem areas that weren't prioritised and check if they are covered by the causes identified



Now you have established what the community and other role player's perceptions are of the problems and their causes. This information needs to be supported through further testing.



Use on-site verification approaches to follow-up and investigate further what the possible causes are. (See suggestions for verification at the end of this Chapter).



Build the information gathered through this process into a Problem Tree and test this with the group and community.



If necessary (e.g. if there are new findings), meet with the group again in a participative process to check additional information or to investigate further.

2 How do you identify the Causes of the Problems?

a) What are causing the problems?

The aim of the Problem Analysis is to find out what has caused or is causing these problems. The causes could be attributed to any combination of the following:



(See Section 3.1 in the [National Strategy](#))

Table 3: Typical questions to determine problem causes

CAUSE OF PROBLEM	Example of problem in solid waste stream	Example of problem in sewage waste stream	Example of problem in Sullage waste stream	Example of problem in stormwater waste stream
It is a PHYSICAL problem when no services are provided or when the services are inadequate.	Are there dustbins?	Does the sewage system work?	Are there designated areas for disposing of grey water?	Are there storm water drains? How does the topography affect the run-off system?
It is an INSTITUTIONAL problem when the services are not operated or maintained properly.	Are the dustbins cleared regularly?	Are blockages, buckets or pits cleared?	Is grey water left to flow in the street?	Are the drains cleared regularly?
It is a SOCIAL problem when people do not use or pay for the services properly.	Do people use the dustbins? Do they pay for the service?	Do people use the system properly? Do they cause blockages?	Do people throw their dirty water directly into the rivers or into the streets?	Do people throw litter into the streets or directly into the drains?



TOOLS & TIPS

It is very unlikely that any cause will exist in isolation from another cause and there will, therefore, be numerous connections between physical, institutional and social causes.

b) Why is it important to know what the causes of the problem are?

The better we understand the problem and its causes, the more likely that our solutions will be the most appropriate ones.

For each of the problems that the stakeholders prioritised you now have to establish the possible causes. For the purposes of structuring the process and not missing anything out you should focus separately on physical, institutional and social causes. However, as you proceed, links between the three will start to emerge, and these links should be made (See Chapter 4). You should also make sure that you have identified physical, institutional and social causes for each problem.

c) Suggested processes for getting to causes

(Step 1): For each priority problem that has been identified you now need to identify what the physical, social and institutional causes are. This can be done through facilitation in the main group. Or you can break up the Working Committee into smaller groups (of about 4 –5 per group). Each group could be allocated a different set of problems or a different waste stream (with associated problems).

Main group or small groups?

The decision on whether to facilitate the process with the main group, or divide the Working committee into smaller groups will depend on a number of factors:

- Size of the group.
- Availability of other trained department officials to work with each of the small groups.
- The level and abilities of the groups to manage the process themselves.
- The choice of the group.

(Step 2) Each group moves to a separate location and chooses its own facilitator.

(Step 3) Each group is responsible for getting to the underlying causes of the problems allocated to it, and capturing all of these causes on separate index cards. Each small group should place their index cards into cause / effect relationships as far as they can.

(Step 4) The facilitator circulates to each of the groups and assists with the process.

(Step 5) Small groups report back to the main group. Others in the main group are given an opportunity to add to and amend the causes.

(Step 6) The facilitator integrates the mini-problem trees into the main problem tree by making further linkages between problems and their causes.

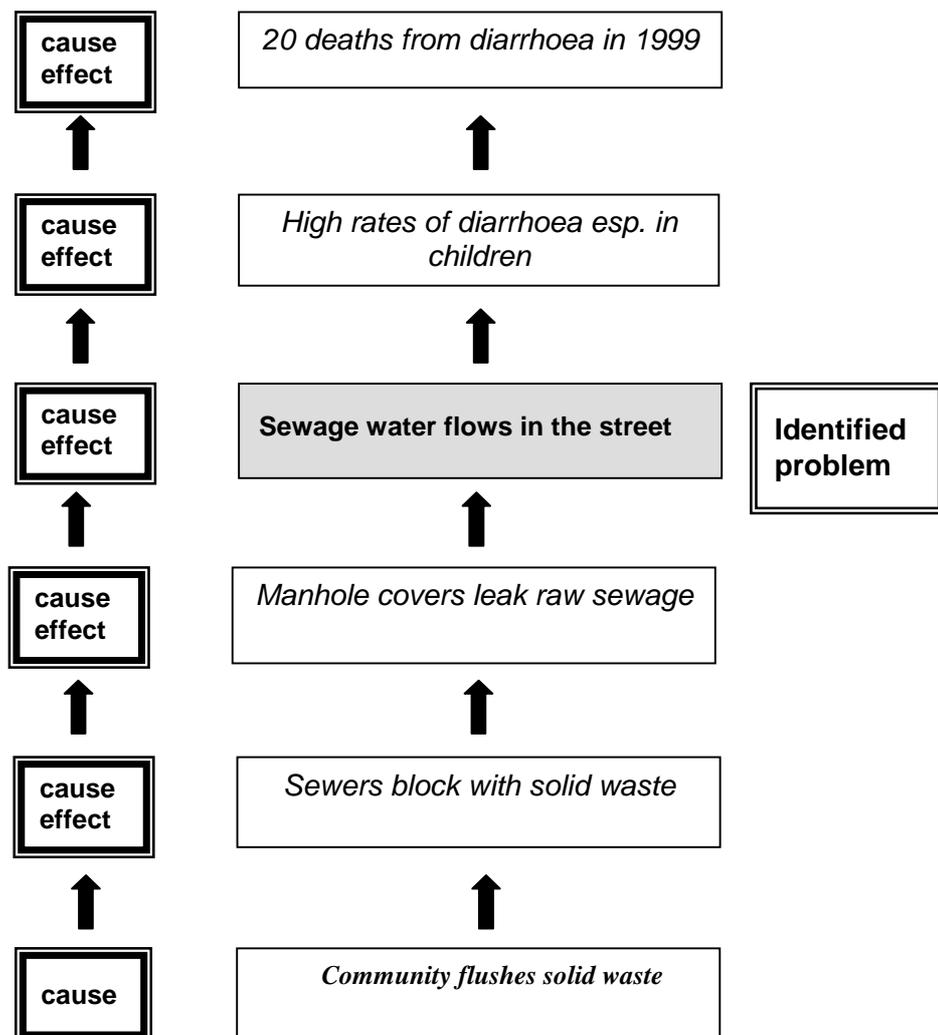


TOOLS & TIPS

How do you get to causes?

The method used to get to the causes of each of the problems is to ask the question “Why”. For example, if an identified problem was “Sewers always block”, you need to ask: “Why this is so?” If people are not sure of the reasons or are not sure what you mean by the question, you need to have some questions in mind to help facilitate the “Why” question. For example: Do you often see water coming out of the manholes?

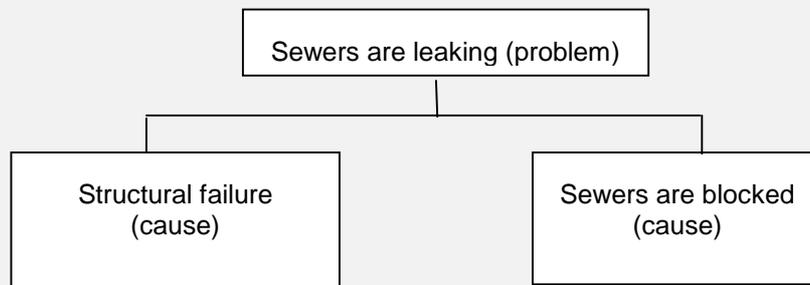
d) Example of the relationship between cause and effect





TOOLS & TIPS

There is often more than one cause of a particular problem. All the causes need to be reflected. This can be depicted as follows:



You need to be sure that all the causes (physical, institutional and social) are being uncovered. It makes sense to structure the process by starting with the physical causes, as they are the most visible. Institutional and social causes will flow from there.

It is impossible to keep them strictly separate because they are so closely inter-linked. But you need to keep in your mind that all need to be addressed, so through your facilitation, you need to make sure that you ask questions in a structured, logical way, so as to unpack all the causes.



TOOLS & TIPS

It sometimes helps to try to develop a preliminary Problem Tree before you go into the Workshop. However, the purpose of this is to guide you and to help you ask the right questions so keep the preliminary Problem Tree to yourself.

REMEMBER

The final answers may not look anything like your preliminary example!

3 Guidelines for Unpacking Physical Causes

Below are some guidelines on what you should be looking for when unpacking the physical causes. This process starts linking the process of developing the Problem Tree with the process to identify solutions as set out in the “Guidelines for Implementation” Manual (Volume 2).

i) Are the causes of the water quality problems physical causes?

There are certain generic physical issues that cause water quality problems. These are:

- Are the services appropriate for the settlement density?
This assessment is based on the impact of the level of service relative to the size, density, layout and siting of the settlement. It also takes into account natural physical features. (See Table 4.1 in the Planning Report). You should also ask the City Engineer if the sewer system is overloaded.
- Are the waste services broken ?
You should look for broken pipes, broken toilet seats, overflowing sewers, full pit latrines, broken waste bins, missing equipment etc. You could also try to find out if the waste services trucks can reach all parts of the settlement (i.e. are the roads too narrow. These are all physical problems, but most are caused by institutional or social problems
- Natural physical features make these problems worse.
The type of soils and topography in the settlement, as well as ground water depth can make the problems worse. The more sensitive and important the receiving water resource is, the greater the impact of these physical features.

It is important to have these generic causes in mind when you are investigating the physical causes. However, each settlement is different and these factors will look different in each settlement. Therefore, you have to go much further to understand exactly what the physical causes are that are causing the water quality problems in the particular settlement.

ii) Examples of the kinds of questions you could ask the Working Committee in order to facilitate out the physical causes could include (See Table 5 as well):

- Are people growing crops near the riverbanks?

Why is this a potential problem?

This may cause sediment build up and destroy the habitat.

- Are there backyard industries?

Why is this a potential problem?

They may be disposing waste into the storm water or sanitation system.

- Is any construction going on in the settlement?

Why is this a potential problem?

It may be causing serious sediment erosion and habitat destruction, particularly where this is in the riparian zone.

- Are the toilets/sanitation/sewer system working well?

Why is this a potential problem?

It will be causing serious health threats or microbiological and nutrient pollution of rivers.

As you uncover the physical causes write them on separate cards.

4 Guidelines for Unpacking Institutional Causes

- a) Are the causes of the water quality problems institutional causes?

There are certain generic institutional issues that cause water quality problems. These are:

- Services are not adequately operated and maintained.
- The Local Authority does not have capacity³.
- Financial resources are not available.
- Pollution is not a priority for the local authority.
- Collection is not reliable or regular
- There is poor communication between the Local Authority and community

Once again, it is important to have these generic issues in mind when you are investigating the institutional causes. However, each settlement is different and these factors will look different in each settlement. Therefore, you have to go much further to understand exactly what the institutional causes are that are causing the pollution problems in the particular settlement. The [Monnakato](#) Test Case provides some good examples of institutional causes of pollution.

- i) Unpacking the institutional causes through consultation

Once again you will follow the same process that you followed when unpacking the physical causes. That is the process can be done through small group work or by facilitating the process in the main group. For each problem identified, and for each physical cause identified, you will now be asking the question “Why”. “What causes this?” “Why does this happen?” This time you will have the generic institutional issues in mind.

³ The National Strategy emphasises the concept of Institutional Capacity. This is defined in its broadest sense as including the agency’s mandate, legislative instruments, organisational capacity, technical capacity (human resources, problem solving capacity and information systems), financial capacity, procedural capacity (policies, manuals, guidelines, codes of practice), and networking capacity (associations with other stakeholders).

You would use consultation to find out the following information:

- Do the community complain that even though they have services, there are always service problems? You need to unpack the institutional causes of this problem. Below are some guidelines:
 - Is the service operated and maintained properly?
 - Are local, provincial or national authorities taking responsibility for managing pollution in the settlement?
- Is pollution a priority for the Local Authority?
- Does the LA understand the problems?
- Is the LA willing to take responsibility for pollution management in this settlement?
- Are the authorities aware of the pollution problems, but they haven't done anything about it yet?
- For what reasons:
 - ❖ lack of capacity?
 - ❖ Ignorance?
 - ❖ lack of political will?
 - ❖ lack of knowledge of available solutions?
 - ❖ don't want to pay for untested solutions?
- If the cause is identified as "lack of capacity", you need to identify what the causes of this lack of capacity are:
 - ❖ Is it a lack of financial resources? If so, why?
 - ❖ Is this because: grants from national, provincial and district are not available?
 - ❖ Or because of the way the local authority has allocated its budget?
 - ❖ Or because people are not paying?
 - ❖ Or not paying enough for services? (this could become a social cause).

How do you find this out:

- *Do the community complain of frequent service failure?*
- *Is rubbish collected regularly?*
- *Are streets, open areas and river banks kept clean?*
- *Who keeps them clean?*
- *Who should be keeping them clean?*
- *If this is not happening, why isn't it happening?*
- *What is being addressed in the area?*
 - *delivery of service*
 - *water quality management*
 - *both*
 - *none*

How do you find this out?

By asking the stakeholders (including officials, councillors, community members and community leaders) what sort of pressure the leadership is putting on the councillors to address these issues



TOOLS & TIPS

Sometimes the community simply cannot afford to pay for the full costs of services, or may not be billed correctly. Here you may have to aim for at least part payment.

- Maybe the lack of capacity is as a result of one or more of the following reasons:
 - ❖ Lack of personnel resources (staff to do the jobs)?
 - ❖ Lack of technical knowledge and skills?
 - ❖ Lack of experience?
 - ❖ Lack of technical resources (such as the correct instruments or tools)?



TOOLS & TIPS

As you uncover the institutional causes write them on separate cards. Paste these onto the board tree to illustrate the cause / effect relationships.

5 Guidelines for unpacking social causes

i) Are the causes of the water quality problems social causes?

There are certain generic social issues that cause water quality problems. These are:

- Services are not used appropriately because of a lack of awareness.
- Consumers are not paying for services.
- Community members do not support the objectives of the strategy.
- The settlement is unstable.
- Vandalism occurs.

Once again you will follow the same process that you followed when unpacking the physical and institutional causes. This time you will have the generic social issues in mind. It is important to get to the real underlying problems. Each problem therefore needs to be unpacked to arrive at a root or core problem, which may relate back to institutional and physical problems and issues. This is an important part of the creation of the problem tree, as it demonstrates the linkages between the physical, social and institutional problems.

ii) Unpacking the social causes through consultation

You would use consultation to find out the following information:

- Is the community using the services appropriately?

- Is the inappropriate use of services as a result of:
 - ❖ Lack of an alternative because service level or operations are inadequate?
 - ❖ Ignorance about how to use the service?
 - ❖ Ignorance about the consequence of not using the service properly?
 - ❖ Convenience? (e.g. conditions relating to the service are not user-friendly, therefore it is easier and more convenient to use them inappropriately)
 - ❖ People making illegal connections?
 - ❖ People vandalising the service?

- Is the community paying for services?

- ❖ Is the service affordable in relation to household⁴ income distribution over the entire settlement population?
- ❖ Are the payment levels too low for the services provided?
- ❖ Has additional funding been sought to subsidise low payments (Indigent / Equitable Share Fund)?

How do you find this out?

- Through consultation, the stakeholders will give you their perceptions on this.
- The level of payment in a settlement can be estimated from Local Authority records.
- The reasons for low payment must be based on socio-economic surveys of the inhabitants. This would be done when verifying the findings through site visits (see below).

- Is the community aware of the impact of their actions on pollution?
 - ❖ Are they aware of the relationship between pollution, health and environmental problems?
 - ❖ Are people aware of the above but they do not see it as a priority? Why? What are they prioritising instead?

- Is the settlement stable?
 - ❖ Is the population relatively stable?
 - ❖ Are leaders legitimate?
 - ❖ Is there security of tenure?
 - ❖ Are community structures well developed?

Why do you need to know this?

Because if this is the case, some people will have other more pressing priorities and a little stake in the settlement's future. They will therefore be less likely to support interventions.



TOOLS & TIPS

As you uncover the social causes write them on separate cards. Paste these onto the board to illustrate the cause / effect relationships.

⁴ "Household" refers to a nuclear family household or an extended family household

SECTION C: VERIFYING THE SYMPTOMS AND CAUSES

1 Integrated approach

The consultation meetings with the Working Committee are essential for capturing the views and perceptions of the stakeholders. However, not everything can happen through consultation (e.g. testing water quality through sampling). In addition, the views and perceptions captured during the consultation meetings need to be verified through on-site visits.

Some of these on-site visits will happen during the consultation process and some will happen right at the end. In both instances, it is advisable to include members of the Working Committee in these site visits. Not only will the stakeholders benefit from the learning experience, but the findings will be much greater as the stakeholders know the settlement far better than an outsider and will know where the problem areas are.

2 Verifying causes through site visits, sampling and surveying

Most of the causes of the water quality problems, identified through consultation, need to be verified with factual evidence obtained through site visits, sampling and surveying. This serves the purpose of supporting the perceptions of the stakeholders and providing more scientific back-up data to support the need for interventions.

- What is the topography of the area?
- What kind of soil is it? Why is this important? - Depending on the type of soil, storm water will wash off or infiltrate into the soil. For example, rocky soils result in increased storm water runoff - this impacts sullage drainage and on-site sanitation.
- How deep is the water table? Why is this important? The closer to the surface the ground water is, the greater the problems with sanitation and storm water systems. For example, pit latrine sewage in porous soils may infiltrate shallow groundwater. If the community makes use of borehole water in the settlement, this water could very well be contaminated. Likewise, polluted storm water could also infiltrate porous soils with shallow groundwater, causing potential contamination.
- To establish the level of payment in a community, you would need to consult the Local Authority records.
- The reasons for low payment must be based on socio-economic surveys of the inhabitants.

Once you have completed the verification process you need to go back to the causes identified during the consultation process and make appropriate adjustments and additions to reflect any new or different information you uncover.



TOOLS & TIPS

Verifying symptoms through site visits

The extent of the pollution problem can be assessed by taking water quality samples and comparing these to the Resource Quality Objectives (RQO's). These RQO's will be a set of concentration limits, and biological criteria (e.g. the presence of certain species), which will indicate where to focus pollution control efforts.

Pollution problems can also be detected by simple **observation**. Look out for:

- Visible signs of litter and pollution in surface waters or storm water drains.
- Broken or blocked sewers.
- Constant flow of water in the streets, even in dry conditions.
- Signs of vandalism.
- Signs of people disposing of dirty water in the streets.
- Encroachment of houses onto river banks.
- Agricultural activities near rivers.
- Signs of algal growth.
- Signs of sedimentation.

You can also verify the symptoms by looking at the incidence of diarrhoea, the amount of waste collected, changes in community behaviour or perceptions, or the incidence of sewer blockages and other data from the Local Authority.

3 Verifying symptoms through site visits:

The purpose of verification is to focus on the **effects or symptoms** of water quality problems in the receiving water environment.

Consult local health officials regarding the incidence of water-borne diseases. For example, ill health is an effect of poor water quality. The cause may be that surface or ground water resources have been contaminated.

Look out for algae growing on the rocks or sedimentation of downstream impoundments. This may indicate nutrient or sediment problems. White 'sewage fungus' also indicates severe pollution from settlements.

Identify degradation of the ecology or aesthetic quality of surface waters (how it looks, e.g. foaming or litter). This may indicate habitat destruction or solid waste problems.

4 Verifying causes through sampling:

This involves taking and analysing water samples against appropriate water quality indicators (physical, chemical, biological).

It also involves reviewing data where ongoing monitoring is conducted.

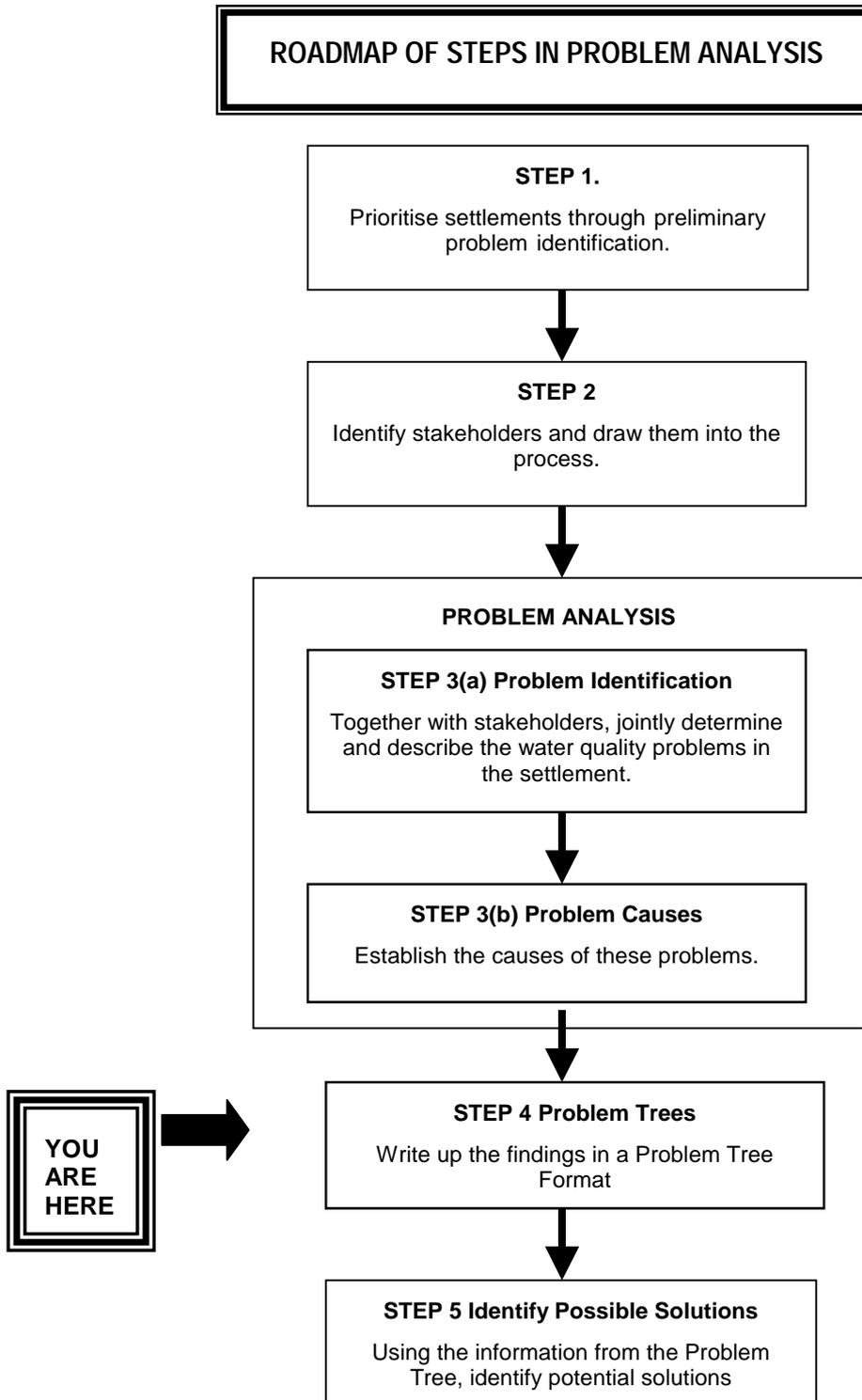
These tests let you know objectively how the water quality compares with the desired conditions.



TOOLS & TIPS

You will need to demonstrate that the interventions you have identified have actually improved conditions in and downstream from the settlement. It is therefore important that you collect quantifiable data on the symptoms of pollution early on in the process. This will also help you motivate for more funds or can help get people involved as you can show real problems and improvements.

CHAPTER 4: DEVELOPING PROBLEM TREES

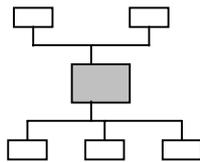


SECTION A: WHAT IS A PROBLEM TREE?

Problem Trees do more than just outline the root causes of the problem. They provide a visual breakdown of problems into their symptoms (e.g. littering) as well as their causes (e.g. ineffective waste management). This can be a useful tool in building the community's awareness of the problem, how they and others contribute to the problem, and how these problems affect their lives. This is critical when trying to build support for your interventions.

In our case, the trunk of the tree is pollution of water resources, the branches are the effects of this (i.e. poor community health, increased treatment costs, etc.), the roots are the causes (i.e. sewer blockages from inappropriate anal cleansing materials, etc.). Seeing the picture of the whole problem tree may encourage the community to support the interventions.

A problem tree is a tool used to build up a picture of problems and their causes and effects. The easiest way of developing the problem tree is to use cards that can be moved around and linked.



The problem tree allows participants to see both the range and extent of the problems. They can see what the effects of the problems are and what the causes are. It also helps us to understand the interrelationships between problems and causes.



TOOLS & TIPS

Ways of seeing the Problem Tree

The Branches of the Problem Tree are the SYMPTOMS. Typical symptoms include:

- ◆ People getting sick.
- ◆ Increased costs of treatment.
- ◆ Loss of Biodiversity.
- ◆ Polluted and unsightly rivers.

The Roots of the Problem Tree are the CAUSES of the Symptoms. The cause indicates the reasons for the problem. You need to dig until the ENTIRE root cause is uncovered. This is done by continuously trying to understand the CHAIN OF EVENTS that result in the specific symptoms being observed.

You have to keep probing deeper and deeper and asking questions like “Why did this happen?” Eventually you will start arriving at the root causes of the problem.

SECTION B: DEVELOPING A PROBLEM TREE

1 Steps in developing a problem tree

Step 1: Identify all the problems with regard to water quality in the four different waste streams. (Use the process set out in Chapter 3.)

Step 2: Use the information obtained through participation with stakeholders (e.g. the information obtained from the Working Committee) Prioritise about 10 problem statements. Each should be written on its own card.



TOOLS & TIPS

Suggestions for Developing the Problem Tree

A Problem Tree is best developed by a smaller group of people who are familiar with the settlement and problems. This group can more easily focus on the water quality impacts and on issues that can be easily addressed (see Problem Identification Process set out in Chapter 3).

It is difficult to develop a Problem Tree in a Workshop situation with a large group of people.

Step 3: To start with, select one problem for the analysis. This is not necessarily the main or most important problem. Rather this is a statement that provides a starting point for building the tree. Write this statement on a different colour card.

Step 4: Go through the cards that were compiled during the problem identification process to establish the causes and effects of this particular problem. (See below – How do you identify the causes of the problems?)

Step 5: Use the notes that you made during the participative process as basis to write up the key points of the problem on index cards. If you find that you do not have sufficient clarity about the causes to address it properly in the problem tree development, ensure that you obtain sufficient additional information at that point or as soon as possible to complete the problem tree accurately.

Arrange the index cards on a convenient surface into cause and effect relationships around the focal problem.

a) How to write a problem statement*

Guidelines	Helpful wording	Unhelpful wording
◆ Write one problem per card	<i>The water is contaminated. (one card) ✓</i> <i>Women walk 4km's for clean water. (another card) ✓</i>	The water is contaminated therefore they have to travel far to get clean water. x
◆ Do not write "No ..." unless this is absolutely true	<i>Waste collection is inadequate for the needs of the settlement. ✓</i>	There is no waste collection. x
◆ Be as specific and accurate as possible	<i>Sewers overflow during storm weather. ✓</i>	Sewers are always overflowing. x

*Adapted from "Project Planning for Development" 1998 Olive Publications Durban, South Africa

Step 6: As you do this, test the logical flow of the arrangement by doing the following:

- ❖ Add cards if needed to complete the cause and effect logic. That is, if there is a gap in the logic you will need to explore what is causing the problem, or what the effects are.
- ❖ Remove cards that are repetitive.
- ❖ Rewrite cards to be more specific and accurate.
- ❖ Be sure the statements are meaningful.

Step 7: Review the problem tree with all relevant stakeholders to ensure that they agree that the cause-effect relationships are valid.



TOOLS & TIPS

A problem tree allows us to analyse the problems and the relationships between them and helps us identify visible solutions.

It is important that all the stakeholders develop a common understanding of the problems and how they are connected. It is therefore most important that the stakeholders represented in a working committee understand community problems. Frequent consultations should occur between community representatives on the Working Committee and the broader community. This should be built into the terms of reference of the Working Committee.

IMPORTANT ISSUES TO REMEMBER IN THE DEVELOPMENT OF A PROBLEM TREE

- ◆ Focus on ONE issue at a time
- ◆ Keep it Simple
- ◆ Test the Logic of what you are doing by saying “If /Then”. If the statement cannot logically be worded in this manner, it is almost certain that there is not an inherent cause/effect relationship in the two components.
- ◆ When you have categorised root causes into the categories “Institutional”, “Social” and “Physical” in a non-participative manner, ensure that you go back to the relevant stakeholders to ensure that your assumptions are correct.
- ◆ Always remember that you are identifying underlying causes and developing Problem Trees from a **WATER QUALITY PERSPECTIVE**.

The need for ensuring the above focus can be illustrated most readily by the following case history and the two potential problem trees that could be developed:

2 Case Study

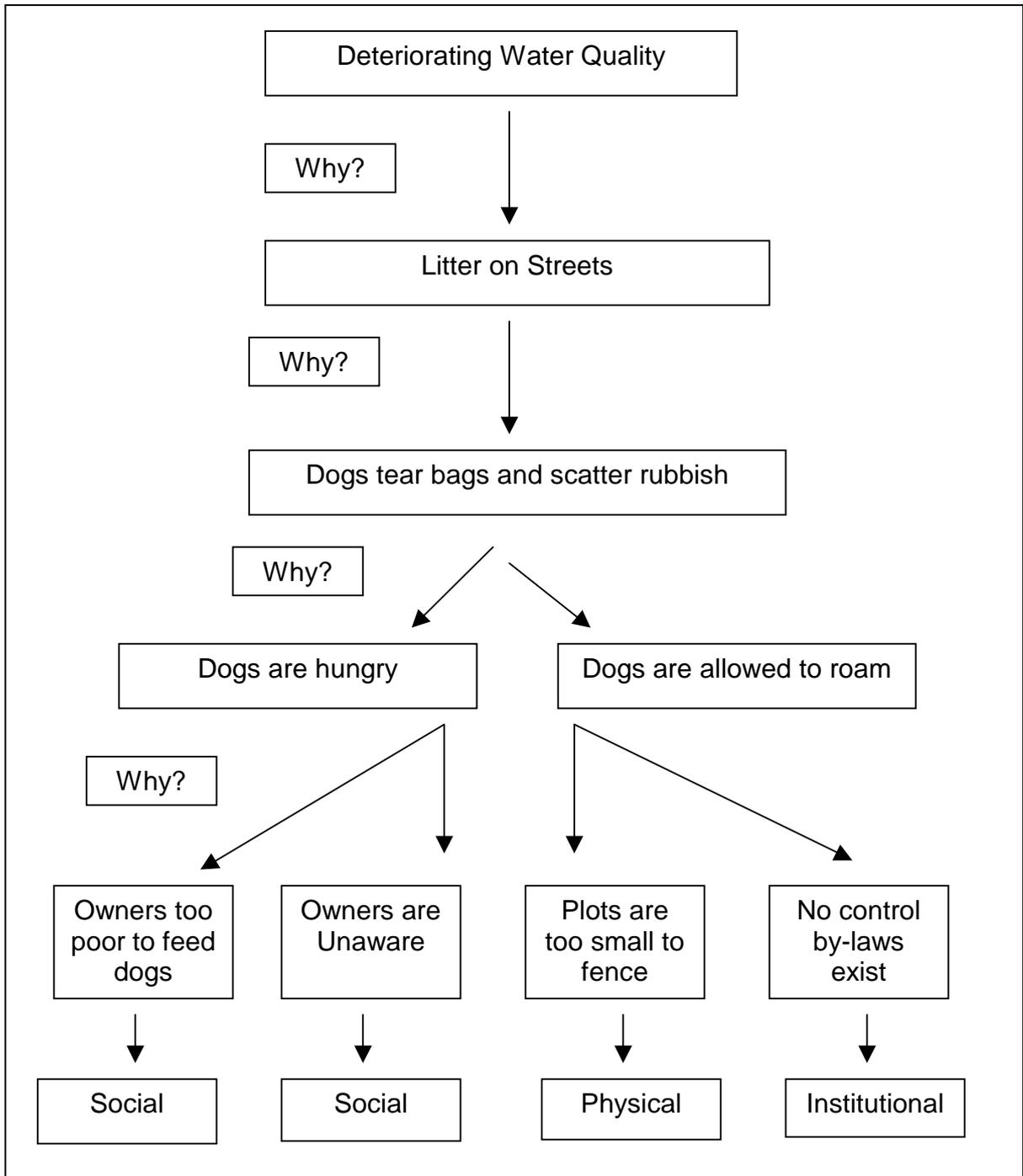
The main problems in the settlement come from litter. The major issue identified is that the community experiences extensive problems from litter on the streets. During thunderstorms this litter is washed into the drainage system, and then into the river.

CAUSES

The main problematic waste stream relates to solid waste management. The community members bag their refuse regularly and do not directly cause the littering. There is also a contractor who has been appointed by the local authority to collect waste. The contractor collects waste once a week. Community members also put out the bags for collection by the local authority contractors.

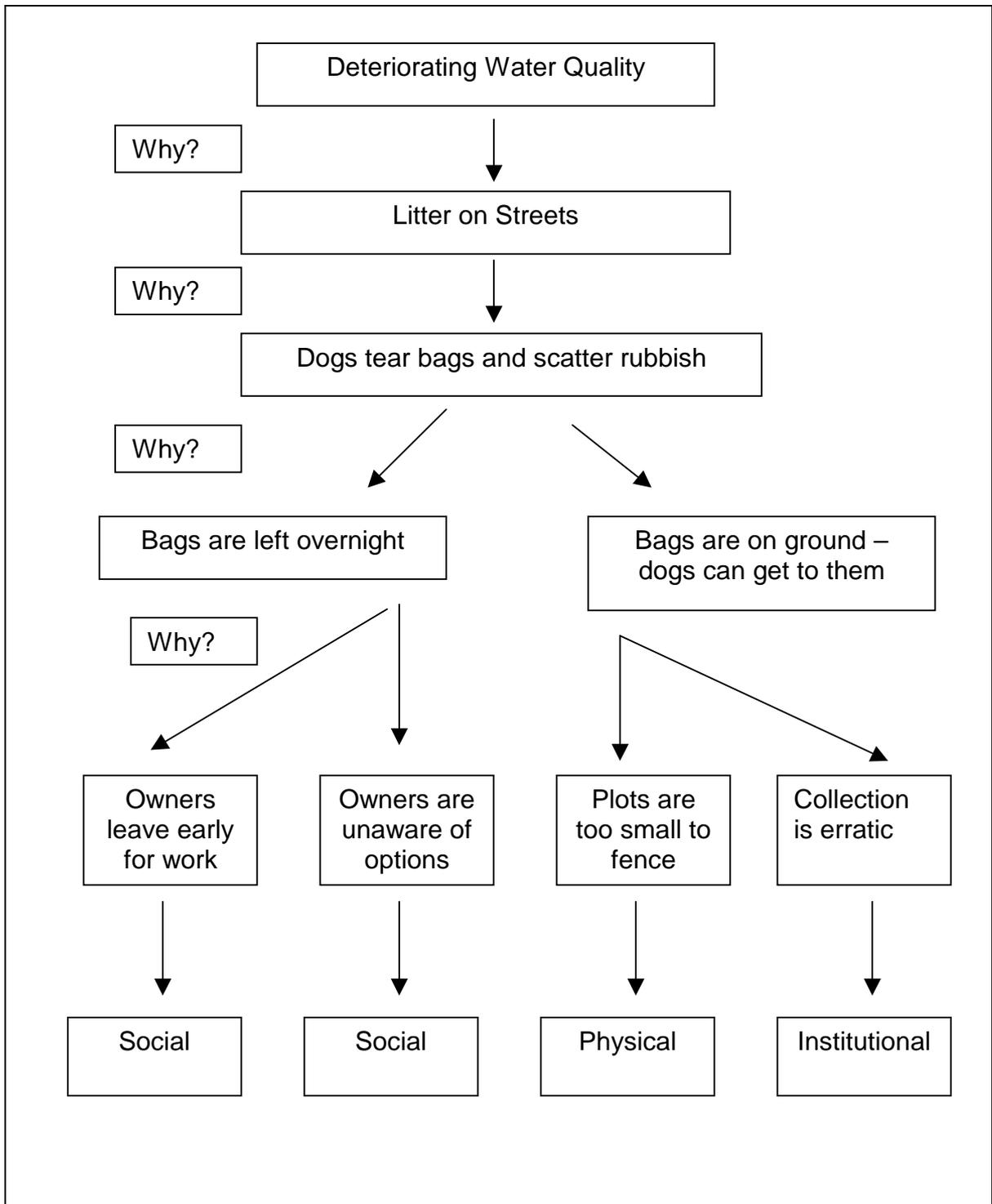
However, waste collection is erratic because there is no set day on which the waste is collected, the individual plots are too small to keep the bags inside the plot and most plots are not fenced. In addition, there are a large number of dogs that roam around on the streets. These dogs tear open the bags looking for food and, in this process, scatter rubbish fairly extensively.

If one FORGETS THAT YOUR FOCUS IS ON PEOPLE AND POLLUTION, the following problem tree can be developed from the Case Study information:



Despite the fact that the above problem tree probably provides a fairly accurate breakdown of a problem as well as the specific root causes, it is clear that this specific tree would be of more interest to the SPCA than to someone trying to address pollution by changing the way in which services are used and supplied.

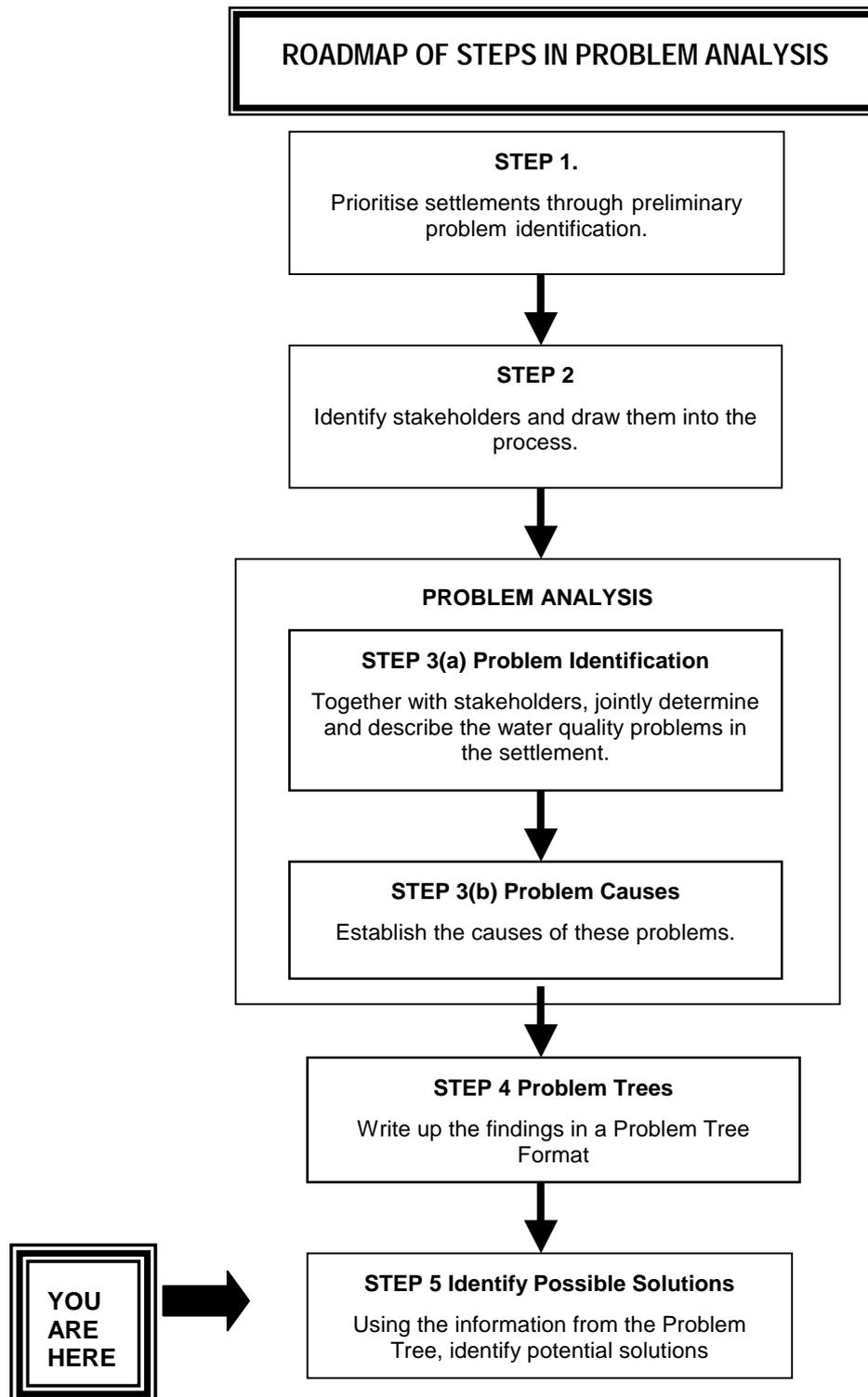
Using pollution management as a point of departure, the following problem tree can be developed from the SAME information provided in the Case Study:



A number of additional examples of problem trees are provided in the [Test Cases](#) reports.

CHAPTER 5: How to Identify Solutions

ROAD MAP



SECTION A: FINDING THE RIGHT SOLUTION

1 General Considerations

a) Solutions must be linked to the Problem Analysis

Most communities have a natural desire to have the best possible services. They often associate the pollution problems they experience with their current low levels of service and believe that an improvement or upgrading of services will address the pollution problems being experienced. However, the Strategy is not aimed at ensuring higher levels of services. It specifically aims at addressing the pollution problems within the context of existing services. For this reason, interventions are defined as actions that will address (solve) the physical, social and institutional causes of pollution.

For this reason, the Structured-Facilitated process that you have followed is specifically designed to allow stakeholders to help identify the causes of pollution in the settlement. This process is also designed to ensure that there is consensus on what the problems are **before** any solutions are proposed.

b) Complexity of the Problems

It is important to remember that pollution problems are too complex to provide simple answers. Because of this complexity and the fact that each problem will usually have underlying physical, social and institutional causes, no single solution or intervention will be able to address all the problems and their causes.

A range of interventions will need to be developed to address the problems as well as the causes. This range of interventions should, together, “solve the pollution problem.”

c) Finding the Right Solution

Finding the right solution is dependent on ensuring that the real causes of a problem are addressed rather than just the symptoms or effects. If a community complained that they did not have any water, your solution would not simply be to provide them with water brought in by a tanker. You would go through an assessment process to find out why they did not have water. In your investigation you may have found that they were dependent on a ground-water resource that has become so contaminated that it is no longer fit for human consumption. On the other hand, you may have found that they could not pump water from a borehole because the generator had run out of fuel. The solutions to the above problems would obviously look totally different.

In the same way, if the problem analysis identified that pit latrines often overflow when it rains, the solution will be the implementation of a process to prevent water getting into the pits rather than the installation of flush toilets.

The degree to which any potential intervention offers the “right” solution must be measured and tested by asking the following questions:

- Will the intervention address the pollution problem?
- Can the intervention be sustained (in terms of personnel, funding, etc.)?
- Does it provide an intervention that provides the most benefit for the least cost?
- Will the physical, social and institutional causes of the problem be addressed by the intervention.

d) Short-term versus Long-term Solutions

You will find that solutions for a number of the causes of pollution can be developed that have a short-term or a longer-term focus. Sewer blockages (especially small bore systems) offer an example of this. Blockages often occur because newspaper is used instead of toilet paper. Two alternative solutions may be offered to address the problem. The longer-term (more costly) solution may be to put in an alternative system. While this option may be perfectly feasible in the longer-term, it does not address the immediate pollution problem caused by sewer blockages. Short-term changes in the way in which the services are used may be introduced immediately at little cost. If the community is encouraged to limit the amount of newspaper they use, to soften or tear the paper before use or to stagger the use of the toilet it will reduce the number of sewer blockages (and the resultant pollution) within a short period of time. It may also be possible to make a small change to the system to make it work better. The [Masizakhe](#) Test Case is a good example of this.

2 The Capacity Gap and Pollution

a) Failing Services

Experience has shown that the most severe pollution problems are frequently associated with larger, more densely populated settlements with higher levels of service. The pollution problems in these cases often stem from failing services.

While the community may contribute to such failures through a lack of payment for services and/or the abuse or inappropriate use of infrastructure, the root causes of these problems tend to lie more with a lack of capacity at Local Authority level (i.e. an Institutional Problem).

b) Local Authority Capacity Requirements

Local Authorities require some capacity to operate and maintain the services they offer to the community. Within a Water Quality Management context, capacity is required to operate the sanitation, water supply, refuse removal as well as the stormwater services.

The components of this capacity are made up by the following sub-sets:

- Financial capacity (do they have sufficient money?)
- Organisational capacity (do they have the necessary structures in place?), and
- Technical capacity (do they have the people and equipment?)

Where there is insufficient capacity (a capacity gap) in one or more of these components, the Local Authority cannot effectively operate and maintain the services. (See [section 3.3 of the National Strategy](#) document.)

c) What Solutions are Appropriate in this Context?

It is clear that we will need to close the Local Authority capacity gap in the short term in settlements that show significant water pollution problems. However, this type of intervention can be extremely expensive and time-consuming.

Given this problem, our interventions need to seek ways in which the Local Authority can be supported in the operation and maintenance of services in cost-effective ways that can be implemented in the short term. It is inappropriate and impractical to attempt to address the total capacity requirements of the Local Authority through a project of this nature.

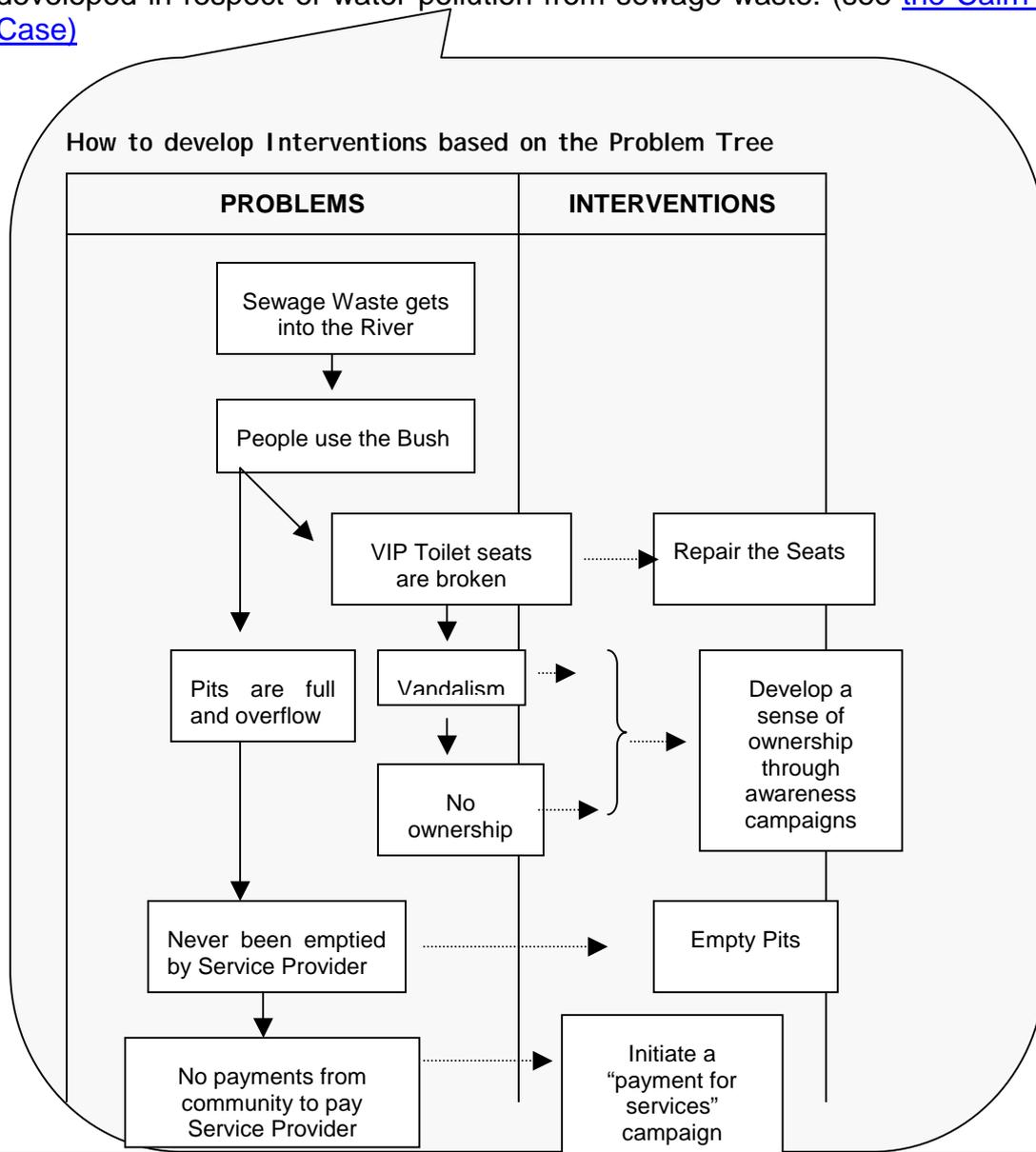
SECTION B: DEVELOPING AN INTERVENTION PLAN

The Intervention Plan should provide a plan for the most effective, least costly way to meet immediate and longer-term water quality objectives based on requirements to address social, physical and institutional root causes identified.

This is done by:

1. Using the Problem Tree that you have developed through the process as a basis, formulate the specific actions that will need to be implemented to solve each of the problems as well as their root causes.

The following provides an example of this process, based on a Problem Tree developed in respect of water pollution from sewage waste: (see [the Cairn Test Case](#))



2. Prepare a Plan that outlines the specific interventions that are required (e.g. effective solid waste management through the development of a community recycling plant, a system of community-based waste collection, an awareness campaign for community and local authority members, training for community-based entrepreneurs, etc, etc.). Use the [Options for Interventions Guide](#) as a basis for identifying and developing a list of interventions.
3. Specify the expected outcomes that must be achieved (e.g. no further dumping and littering, the development of a recycling depot, the placement of recycling bins on each street corner, 5 entrepreneurs trained, etc. etc.). These outcomes need to be specific and offer detailed plans in respect of each;
4. Using the information from points 1 and 2, develop implementation schedules (setting out the time required for each activity as well as indicating what activity will lead into the next), the specific deliverables as well as the costs attached thereto;
5. Using the deliverables as basis (remember that this could be anything from a report, a meeting, a recycling centre or the training and appointment of a community-based entrepreneur) you have already developed your first set of project-specific Key Performance Indicators.

a) Identifying sustainability issues as part of the project

The requirement for the long-term sustainability of projects aimed at ensuring improved water quality must be emphasised. Important factors that have been identified nationally and internationally as promoting long-term sustainability include:

- ◆ Strong community participation & support (including willingness to pay for services);
- ◆ Local Government willingness and capacity to assume responsibility for the provision of services, including the development of partnerships to this end;
- ◆ Developed institutional and administrative infrastructure to maintain the system;
- ◆ A viable local economy.

It is important to develop a coherent, integrated monitoring and evaluation system during the project cycle that will assist in addressing the sustainability issues set out above. Issues that may negatively (or positively) impact long-term sustainability of projects should receive attention as early as possible in the project and should provide the basis for the development of sustainability KPIs during the planning phase. This aspect is addressed in greater detail in the next Chapter.

CHAPTER 6: MONITORING AND EVALUATION

SECTION A: INTRODUCTION

The easiest way of distinguishing between monitoring and evaluation is to see that evaluation is specifically concerned with measuring the consequences of a project while monitoring is concerned with keeping track of the progress being made in a project.

SECTION B: OBJECTIVES OF MONITORING AND EVALUATION

1 Objectives of Evaluation

The objectives of evaluation can be summarised as assisting in:

- ◆ Measuring the improved services (e.g. frequency of waste collection or number of people served);
- ◆ Measuring the social consequences of a project (e.g. an improvement in health, an increase or decrease in disposable income, an increase in the time women have available due to better infrastructure, etc.);
- ◆ Demonstrating the success of a project specifically as it relates to the objectives set for the project;
- ◆ Enhancing the value of current and future projects by identifying key lessons to be learnt;
- ◆ Providing a check on the use of funds released for the project.

2 Objectives of Monitoring

Monitoring has been called the “poor relation” of appraisal and evaluation because it deals with project progress rather than project value. The main function of monitoring is ensure that project is being implemented in accordance with specific objectives that have been set at the outset. These objectives relate to the hardware components of the project as well as to institutional and social components. Examples of these include the level of participation of members of the community, the number of women involved in the project, the number of local entrepreneurs developed, etc.

3 How do you Monitor?

Monitoring is aimed at assessing specific interventions (or solutions to a problem). The interventions are based on the Problem Tree. As such,

4 Outputs of the Monitoring & Evaluation System

It is not helpful to simply gather data and to store it -- it must be actively fed to those who can use it before the system can be of any value. Thus, it is key that the information should be gathered and processed as close to the project as possible and fed back to the key stakeholders so that important interventions and discussions around sustainability can take place from the beginning of the project. Decisions about the specific needs of monitoring and evaluation information will need to be made in conjunction with all role-players at the planning stage of the project.

In the example outlined in three above, if you only monitored if people were using the bush, and you found that they still were and that the river was still polluted, you may not be able to identify why the interventions did not work. Monitoring whether the seats were repaired, whether the pits were emptied and whether the awareness campaigns were carried out would put you in a position where you would know exactly what had gone wrong.

At the same time, it is important that the information be fed into broader levels so that an area-based, provincial and national picture can be built, trends identified and policy and strategic choices can be discussed. As well, the aim should be to allow a sharing of the lessons that have been learnt as widely as possible amongst role-players throughout the country so that an informed “best practice” can be developed. This promotion of “best practice” should, after all be the major purpose of monitoring and evaluation activities.

SECTION C: THE ROLE OF KEY PERFORMANCE INDICATORS (KPI'S) IN MONITORING AND EVALUATION

Both monitoring and evaluation focus on measuring to what extent specific objectives for short-, medium- and long-term change have been or are being met. Key Performance Indicators (KPI's) are the specific measures that are used to evaluate whether or not an objective has been reached.

An example of this is that a project objective may be “the participation of community members”. The KPI set in respect of this may vary, depending on circumstances but could be any of the following:

- ◆ “Number of people in the community attending mass meetings”;
- ◆ “Number of people who are actively involved in promoting the project”;
- ◆ “Number of people who have signed a document that state that they understand the purpose of the project and support it”.



TOOLS & TIPS

KPI's SHOULD BE BASED ON REALISTIC TARGETS

It is important that Key Performance Indicators are based on the achievement of realistic objectives rather than a “wish list” of things that may be impossible to achieve.

For example, if an intervention is introduced that aims at promoting the level of payment for services in a community where no payments are being made, it would be unrealistic to expect 100% payment within three months. KPI's need to address what can realistically be achieved within a specific time span.

The process of developing appropriate Key Performance Indicators (KPI's) during this stage requires that information obtained as part of the prioritisation and problem analysis processes should:

- ◆ Provide as complete information as possible about conditions on the ground;
- ◆ Provide an initial assessment about “minimum” sustainability factors;
- ◆ Be analysed for potential implications and trends;
- ◆ Be shared with immediate stakeholders (community, local and provincial government, funders, etc.) in order to determine specific interventions needed to promote sustainability;
- ◆ Identify the crucial weaknesses and gaps that must be further addressed in the implementation plan;
- ◆ Pull together common threads and feed into the broader regional and national picture that will inform policy development, etc.

It is important to bear in mind that project implementation does not occur in a void. In essence, project implementation will aim at the promotion of competency and capacity of role-players to fulfil specific functions during planning, project implementation as well as subsequent management (including operations and maintenance and cost recovery) of the process.

For this reason Key Performance Indicators need to look at the contextual requirements set for project implementation as well as the human resource development aspects of such activities. Key Performance Indicators will therefore also need to be set to measure the type of capacity building being provided, the progress of the persons being capacitated and the adequacy of the trainer.

SECTION D: DEVELOPING KPI'S

1 Activities Contributing to Sustainability

Key Performance Indicators should be developed at the onset of the project to measure the effectiveness of activities aimed at ensuring:

- Measures to promote, monitor and evaluate community participation;
- Measures to promote, monitor and evaluate Local Government willingness and capacity to assume responsibility;
- Measures to promote, monitor and evaluate the development of institutional and administrative infrastructure to maintain the system (this component does **NOT** refer to a need for elaborate offices and/or personnel for the project. It may purely take the form of community-based management and monitoring committees;
- Measures aimed at promoting or supporting Local Economic Development through a variety of interventions such as job creation, improvements in access to infrastructure, skills training, etc.

2 Further Areas of Focus

The following provides suggestions for specific additional areas of focus.

a) Awareness Creation Activities

Where awareness creation activities form part of implementation, it is necessary to develop criteria and guidelines for monitoring and evaluation of awareness creation activities. This is needed to ensure that such activities have taken place, are achieving the objectives set, are understandable, acceptable and reaching the appropriate targets. This is achieved through the:

1. Development of monitoring criteria to establish whether activities took place on time, according to plan and within budget
2. Development of monitoring criteria for assessing quality of awareness creation activities in terms of targeting, understandability, acceptability and credibility.
3. Development of monitoring criteria for assessing behaviour change.
4. Development of evaluation criteria for assessing to what extent capacity building activities have achieved objectives in respect of organisational and institutional change, participation of role-players, adoption of practices (e.g. behaviour change) in the short and medium term.

b) Data Management and Reporting Activities

It will always be necessary to develop criteria for data handling and analysis as well as reporting procedures. This is to ensure that relevant data is collected, processed, reported and utilised. This is done through:

1. Developing criteria for handling, analysis, processing and inspection of data related to key indicators
2. Identifying specific groups or categories of recipients to receive reports. This should include the specification of the nature of reports as well as their timing and frequency

3 The Need for Contextual Relevance

The above information serves as a basis to illustrate the requirements for monitoring and evaluation rather than trying to provide a long list of indicators that should be measured. A number of additional indicator areas exist that have not been included in this discussion, for example, the health of the community.

Ultimately, the success of monitoring and evaluation is determined by the extent to which they are selected and developed in support of the project plan as well as the short-, medium- and long-term objectives of the project.

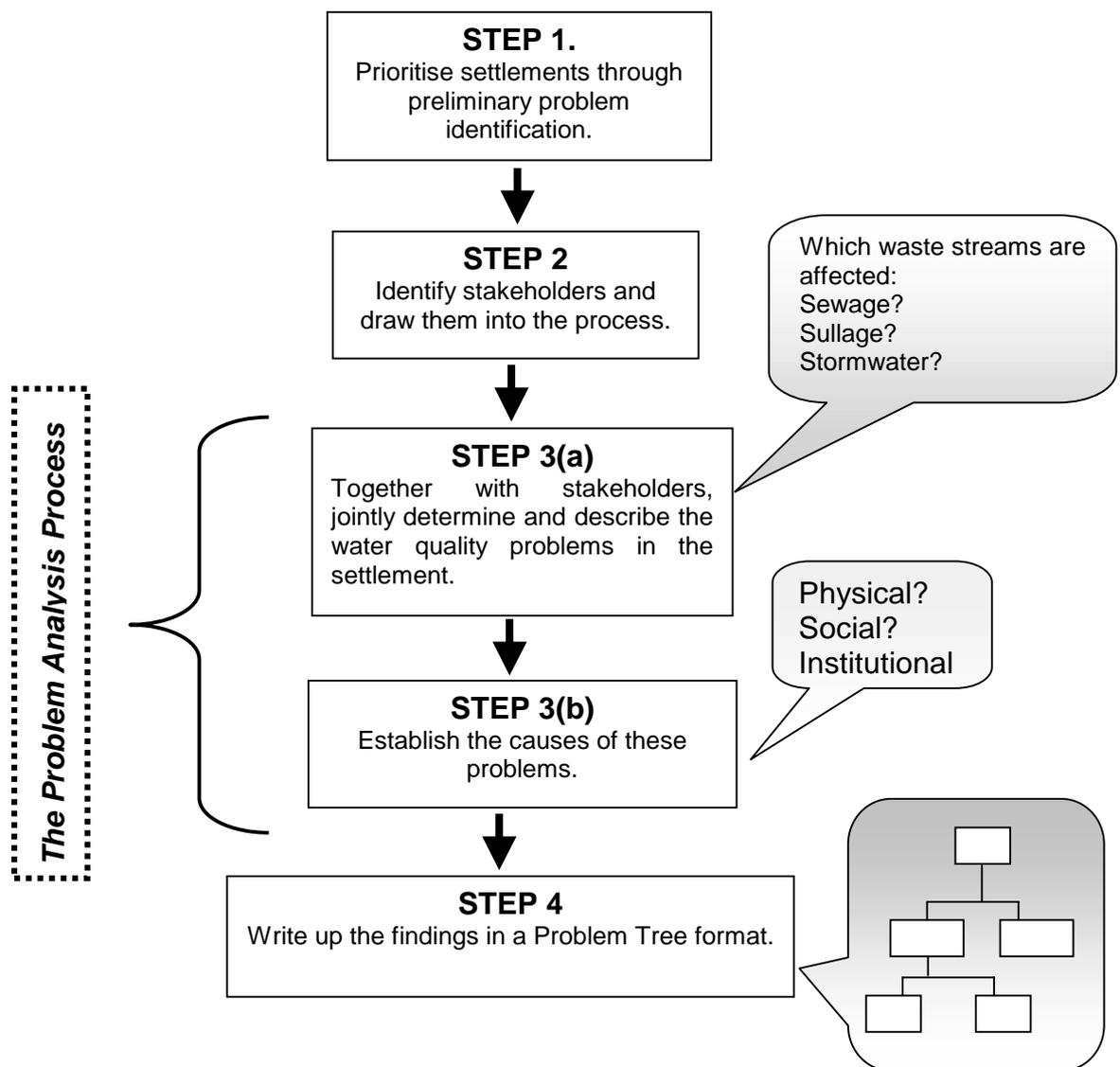
CHAPTER 7: WHERE TO FROM HERE?

SECTION A: RECAPPING

In the Introductory Section to this Guide, you were presented with a Road Map of Steps in the Problem Analysis. The process that you have worked through thus far has taken you through steps 1 - 5 of this process.

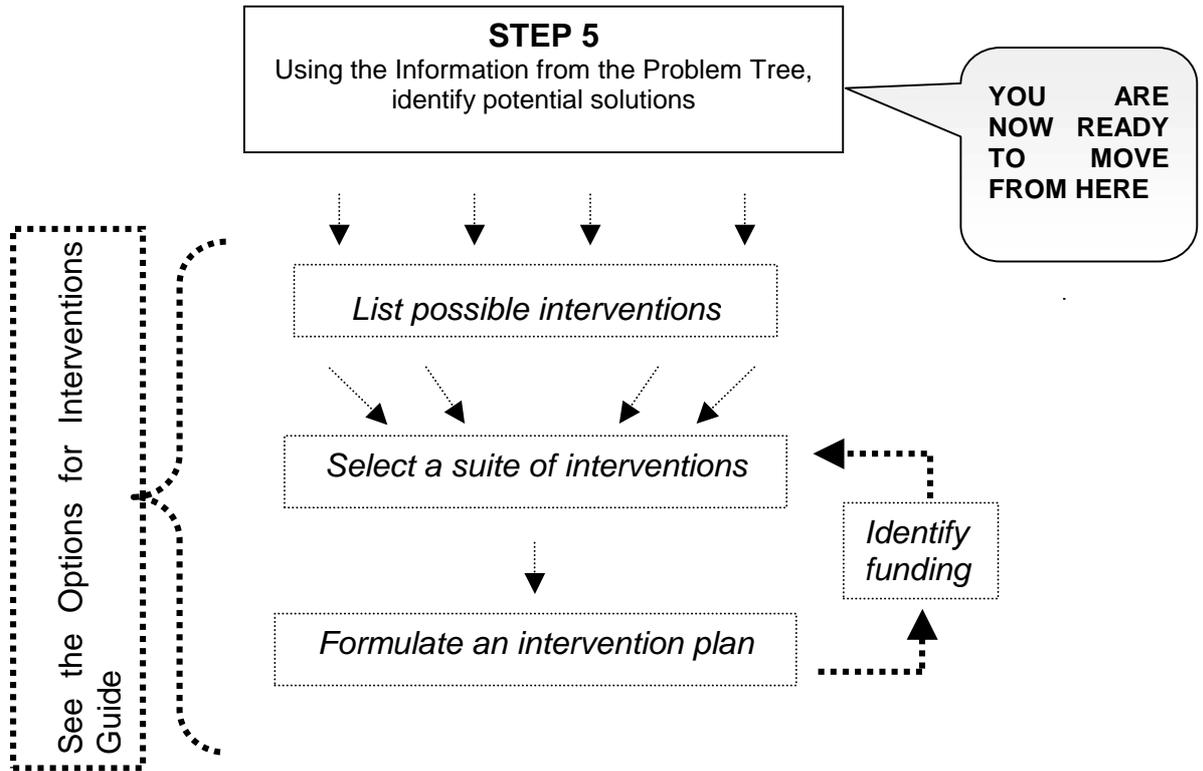
This entailed the following:

Diagram 3: Roadmap of Steps in Problem Analysis



SECTION B: THE WAY FORWARD

You are now ready to move to using the [Options for Interventions](#). This document will help you find suitable interventions for the problems you have identified in the Intervention Plan.



CHAPTER 8: CLUES FOR APPROPRIATE LEVELS OF SERVICES

Service	Typical Problems to look for include:	Settlement Density (dwellings per hectare) ⁵		
		<10	10-40	>40
Solid Waste Management	<ul style="list-style-type: none"> ▪ Litter and rubble lying around; ▪ Overflowing skips; ▪ Litter lying next to a skip and not inside; ▪ Uncollected waste; ▪ Informal dumping areas. 	On-site disposal and burning is adequate for lower densities, but communal disposal is required as densities increase.	Communal collection and formal disposal of household refuse and litter is required, possibly within the settlement itself.	Frequent and reliable formal collection and disposal of solid waste to a landfill site is required.
Sanitation	<ul style="list-style-type: none"> ▪ Pit latrines impacting on a water source; ▪ Evidence of sewer blockages; ▪ Seepages. 	On-site sanitation is adequate, except in adverse geo-technical conditions when lining and maintenance is necessary.	<p>On-site sanitation is generally adequate, although improved designs and more regular de-sludging is necessary.</p> <p>In adverse geo-technical conditions, off-site sanitation may be required at higher densities.</p>	Off-site sanitation is generally required to prevent local ground water contamination. Regular maintenance is necessary to prevent system failure.

⁵ Where dwelling densities number >75 per hectare, normal services tend to be inadequate, and these settlements require re-planning in most cases. Interventions obviously vary from site to site, but extremely high settlement densities are a pointer towards potential service problems. Interventions may include de-densification, multi-storey developments or increased service vigilance in respect of maintenance.

Service	Typical Problems to look for include:	Settlement Density (dwellings per hectare) ⁵		
		<10	10-40	>40
Sullage Drainage (and water supply)	<ul style="list-style-type: none"> ▪ Dry weather flow; ▪ Water pooling at individual and/or communal taps 	On-site soak-away is generally adequate for all water supply levels. Communal standpipes with no soak-away may cause some problems.	At lower densities, on-site soak-away is adequate for standpipes and yard connections. At higher densities, off-site sanitation is required for in-house and yard connections.	At this density, off-site sanitation is required for household and yard connections, as well as for communal standpipes.
Storm Water Management	<ul style="list-style-type: none"> ▪ Erosion; ▪ Blockages (litter and other deposits) that impede storm water flow. 	Unlined channels and low cost road surfacing are appropriate at higher densities.	Lined or unlined channels with surfaced roads are adequate.	Lined channels or pipe systems with detention structures and sealed roads are necessary.