"Documento original en mal estado"

Information

- ❑ Is rainwater harvesting a common technique in the area?
- ❑ In which months of the year does it rain?
- ❑ Does the amount of rain vary each year?
- ❑ What technologies are used?
- ❑ Can the technologies be improved to prevent contamination (e.g. add isolated abstraction structures)?
- ❑ Are the storage units publicly or privately owned?
- ❑ Is there a tariff?
- ❑ What capacity of storage already exists in the area?
- ❑ How long does the stored water last, taking into account existing demands prior to the emergency?
- ❑ Is there a possibility of increasing storage capacity?
- ❑ Who owns the land on which the catchment and storage units are located?

To estimate potential yields:

- ❑ Annual rainfall
- ❑ Temperature variations
- ❑ Permeability of the ground or catchment surface / run off coefficient
- ❑ Size of catchment area
- ❑ Current position in rainfall cycle

Source of information

- ❑ Owners of storage units and catchment land
- ❑ Local populations
- ❑ Observation
- ❑ National and local government

Methods

- ❑ Calculate storage potential, run off capacity, evaporation and seepage. See *Rainwater harvesting* pp253-4

National government / local government / NGO / international organization

This checklist may be used when collecting information from government departments or other organizations working in the field. It contains information included in the main checklists but which is brought together for ease of access during interview.

National or local government (includes organizations managing utilities)

Note that caution is required in conflict situations when gathering information especially from government departments. Requests for aerial photographs and similar items may be misinterpreted. Employer organization and co-ordinating organization (e.g. UNHCR) guidance should be followed in these circumstances. If you are a government employee of the host country or you are working alongside government counterparts this information may be easier to access.

Some of the information may have already been requested by the employing organization, country or regional co-ordinator. Organizational procedures for communicating with official personnel set down by the employing organization should be followed.

Reasons for contacting the host government:

- ☐ You are guests working in their area of responsibility
- ☐ It is necessary for gaining government approvals
- ☐ They will be responsible for looking after the facilities when the outside organizations leave
- ☐ They may be able to provide or loan resources (both human and material)
- ☐ They could be useful sources of information
- ☐ They know the area and probably the location, size and quality of water sources
- ☐ It can provide links with local populations
- ☐ A good relationship with the local authorities can reduce possible frictions
- ☐ It is courteous

Departments which may be useful to contact:

- ☐ National or regional government, administration of refugee or returnee affairs, water resources, environment, geological survey, health, military
- ☐ Local government, administration, water and sewerage, surveying, social, planning, engineering, public works

When meeting with government departments it may be useful to take with you:

- ☐ Information showing who you are and your areas of expertise
- ☐ Documents proving permission to act and letters of support
- ☐ Photographs of past emergency work for subsequent meetings (if requested)

Can the government department give you, or provide information on any of the following?:

- ❑ Logistical constraints
- ❑ Security situation and local clearance procedures
- ❑ Maps of the area (topographic, geological or road)
- ❑ Aerial photographs
- ❑ Aquifer details
- ❑ Numbers and water demands of local populations
- ❑ Water demands and effluent details of local industries and agriculture
- ❑ Government resources which could be made available (possibly for exchange or payment)
- ❑ Personnel assistance (engineers, technicians
- ❑ Introductions to local leaders
- ❑ Contacts for local contractors and specialists
- ❑ Availability of local resources and supplier contacts
- ❑ Standard specifications for materials and equipment which they usually use (especially pumps)
- ❑ Where to find further information
- ❑ Local staff recruitment policy
- ❑ Method of payment for affected population if included in construction work
- ❑ Environmental problems in the area
- ❑ Main concerns of the government and local populations

On specific water sources,

- ❑ Details of land rights and who permission for abstraction should be sought from
- ❑ Construction drawings of sources already used
- ❑ Borehole logs
- ❑ Pumping or yield records
- ❑ Details of operating procedures or problems with existing systems
- ❑ Water quality records
- ❑ Socio political or cultural issues to be considered when dealing with water
- ❑ River basin studies

Additional for national government

- ❑ Permission to become active
- ❑ Procedures for importing goods
- ❑ Letters of introduction
- ❑ Line of government responsibility
- ❑ Policy and level of support to the affected populations
- ❑ Designated agency responsible for co-ordination of the interventions (often UNHCR)

Non-governmental organizations and international organizations ■

Much of the information noted above may also be requested from non-governmental organizations and international organizations working in the field. Requesting information from more than one source can verify or dispute information already collected. In conflict situations or where governments are inoperational, other field organizations may be the best source of information.

Affected population / local population issues

The person undertaking the rapid assessment of emergency water sources in the early stages of an emergency will often have to act within a short time frame. There are key factors which he / she must assess in order to select a water supply and treatment process to provide potable water.

In the initial stages of an emergency, the questioning of the affected population may be mostly superficial with questions used to confirm observations on existing water sources: pollution risks, availability of containers, etc. However, as soon as possible further questioning of greater depth should be undertaken to help the assessor gain an understanding of the populations he / she is supporting. This will help to ensure that the technological solutions are appropriate to the users. Care must be taken to question as many different groups as possible including those who are vulnerable (consider vulnerability on the basis of gender, age, ethnicity and culture). One method of involving the affected population at an early stage is to request that existing community groups come forward (e.g. women's groups or people who have previously been on water committees) when calls are made for workers. Representatives of these groups can then be consulted on subjects such as the suitability of chosen locations for standposts and the cultural acceptability of proposed sources.

Refer to *Guidance undertaking assessments and report writing* pp103-7 for guidance on avoiding assessment pitfalls. **Record answers to questions in the *Conversations / observations* log** pp79-80.

Population / community structure and skills

- ☐ How is the population divided?
- ☐ Who are the population's representatives or acting representatives? (initial contacts for questions)
- ☐ What are the social hierarchies and which are the most vulnerable groups?
- ☐ Are there personnel with the following skills: tradespeople, construction personnel, supervisors, health educators, water technicians, engineers?
- ☐ How are food and other resources presently being distributed?
- ☐ What is the balance of males and females? (A high percentage of single men it may imply that both men and women may have lead responsibility for water usage in different family groups)

Cultural practices

- ☐ Which days are religious / cultural festivals or days of rest?
- ☐ General gender and age roles (before and after being affected by the emergency): who collects water, is responsible for family hygiene, cooks? (can indicate which groups have greatest responsibility for water use and hence who should be consulted)
- ☐ Are there any restrictions for a particular group (e.g. Muslim women in *purdah* may have to collect water in the dark)?
- ☐ Where do people bathe and wash clothes? (potential source of pollution)
- ☐ What forms of sanitation are used? (potential source of pollution)
- ☐ What are the requirements for sanitation: cleaning materials, segregation, level of privacy, water for hand washing? (can indicate level of hygiene practice and hence potential for post-supply contamination)
- ☐ Are there any particular attitudes to water treatment (e.g. are they worried about the use of chemicals)? (could lead to rejection of water supply)

- ❑ Do women have any particular needs or concerns (for example over water and privacy facilities during periods of menstruation)?
- ❑ Are there any other cultural beliefs related to water not already noted above?

Past and present sources of water and, the populations needs and concerns

- ❑ What types of water source did they use before affected by the emergency (well, spring, stream)?
- ❑ Was it chlorinated?
- ❑ What was the level of service (piped supply, direct from source, etc.)?
- ❑ How much water did they use?
- ❑ Details of the water used at present (what does it taste like, does it look muddy or clear and does the taste or appearance change with the seasons)?
- ❑ Are the water collection containers adequate in number, quality and size?
- ❑ What are their priorities in the supply of water and sanitation?
- ❑ What are their needs and concerns?

Security of water collection points

- ❑ Are there any problems with the location of the water collection points in terms of security or accessibility (especially for women, children, the elderly, those physically impaired, those vulnerable due to their ethnicity, those vulnerable due to conflicts)?

Key references:

Anderson et al, 1992

Davis and Lambert, 1995, pp55-77

Gosling and Edwards, 1995

Water treatment works and urban water supply systems

The following checklists are to be used for the assessment of existing water treatment works in urban environments in addition to the general checklists provided previously.

- ❑ Urban water supply system inventory
- ❑ Resources / spares checklist
- ❑ Water treatment works operational checklist

Sources of information: Local government water and sewerage departments, existing works staff, local and international consulting and contracting firms

Urban water supply system inventory

General

- ❑ Are there maps / plans already available of the supply network?
- ❑ Does a contingency plan for emergencies already exist?
- ❑ Are recent test data results available and inventories of age and condition of pipes and other equipment?
- ❑ Identify damaged sections / items and potential causes of pollution: vandalism, war damage, cross-connections, back syphonage, pipe near sewer, illegal tapping, fire (Hodgson and Tannock, undated)
- ❑ Who is responsible for operation and maintenance of each section of the supply system
- ❑ Identify and map location of
  - ○ *Sources*
  - ○ *Treatment works*
  - ○ *Pumping stations*
  - ○ *Trunk mains*
  - ○ *Distribution mains*
  - ○ *Raw and clear water reservoirs*
  - ○ *Location of consumers (domestic and industrial, including power plants)*
  - ○ *Heights of all features*
  - ○ *Power stations or fuel suppliers (e.g. electricity, diesel or petrol)*
  - ○ *Workshop / storage facilities*
  - ○ Laboratories for water quality testing
  - ○ *Areas susceptible to physical threats (landslides, floods etc.)*

Sources (UNHCR, 1996)

- ❑ **Springs**

  Identify: expected yield at design and date of design; actual yield and date; description and condition of spring box; description and effectiveness of protection above and around spring; potential sources of contamination

- ❑ **Hand dug well:**

  Identify: yield, draw down, lining type and condition; height and number of rings; parapet height and material; apron width and material; depth to bottom of well and to static water level; water drawing mechanism and condition; geology if known; potential sources of contamination

❑ **Borehole**

Identify: drilling company, date drilled, depth and static diameter, pumping test results, date, duration, static water level, drawdown, yield, specific yield, gravel packing type and volume, casing details, type, diameter, length, screen length, percentage of openings

❑ **Hand pump**

Identify: make, model, date of installation, number of strokes required to deliver output, depth drilled, casing and liner subsequent activities, borehole details (as above), serial numbers of wellhead

Pump units and power supply (cont'd from p72)

❑ **Pumps**

Identify: type, make, model, serial number, condition, rated yield and head, actual yield and head, power supply, shortage of fuel for pumping, flood protection, water hammer, cavitation

❑ **Power unit (engine)**

Identify: type, make, model, serial number, condition, hp, rpm, fuel use, cooling system

❑ **Power (generator)**

Identify: type, make, model, serial number, power (kVA), power factor, phase, voltage, amperage, rpm, frequency, condition

❑ **Electrical supply panel**

Identify: type, make, model, serial number, voltage, Hz, hp

Pipelines (cont'd from p72)

❑ Identify: materials, sizes, working pressures, serial on valves on pipelines, water hydrants, standpipes, air valves, corrosion protection, invert levels

Treatment works *see Water Treatment works operational checklist for detailed assessment pp74-8)*

❑ Process operation: process control, hydraulic operation, structural soundness

❑ Operation and maintenance: maintenance programme, chemicals and fuels, disposal of wastes, operational management and availability of skilled personnel, record keeping, budget, health and safety

Distribution

❑ Identify: details and condition of distribution units, wastewater drainage arrangements

Workshop, storage facilities

❑ Identify: capacity of staff, available, adequacy of spares, capacity for storage, management capability and systems

Sewage treatment works and sewerage system

❑ As water supply system and treatment work

❑ Identify possible areas of contamination to the water supply

Solid waste disposal

❑ As for sewage treatment works and sewerage system

❑ Identify solid waste disposal practices in relation to the water supply

Resources / spares checklist

See checklist pp54, 7

Also

- ❑ Locations of factories which make equipment?
- ❑ What supplies does local government have?
- ❑ Who supplies the local government?
- ❑ What equipment do NGOs and other aid organizations have? [illegible] what adapters are required?

Skilled personnel

- ❑ Who is still available from existing staff?
- ❑ Which skills are lacking?
- ❑ Is additional training required for new or modified equipment?

Water treatment works operational checklist

Produce a process diagram and layout map of the operational treatment works including number and sizes of units and any spare land available for expansion

Works details:

- ❑ Built in and upgraded in year ______________________
- ❑ Design capacity ______________________
- ❑ Operating capacity usual ______________________
- ❑ Operating capacity at present ______________________
- ❑ Area of supply ______________________
- ❑ Is the access to the works OK? ______________________
- ❑ Are there any natural threats to the system? (earthquakes, hurricanes, volcanoes, mudslides, etc) ______________________
- ❑ Which sections of the system are most vulnerable? ______________________
- ❑ Can mitigation measures be put in place to prevent further damage? Include details ______________________

Process operation:

Screening / intake

- ❑ Is screening in place and adequate?
- ❑ Are the screens being cleaned?
- ❑ Is the intake protected, such as by a fence?
- ❑ Is it located away from major pollution sources?
- ❑ Can the intake cope adequately with change in water levels?
- ❑ Is the point of abstraction susceptible to erosion?

Raw water storage:

- ❑ What is the turbidity at the inlet and outlet?
- ❑ What is the retention time?
- ❑ What is the size of the reservoir and its effective capacity?

Sedimentation:

- ❑ Are settled solids prevented from being disturbed to the outlet?
- ❑ Does the sedimentation tank have baffles?
- ❑ Is the retention time > 1 hour?
- ❑ How often are the tanks desludged?
- ❑ What is the turbidity at the inlet and outlet?

Assisted sedimentation (coagulation, flocculation, sedimentation):

- ❑ Is the coagulant mixed immediately?
- ❑ How is the coagulant being flocculated?
- ❑ Is the coagulant dose controlled?
- ❑ Is the turbidity at the outlet to the sedimentation tank < 10 TU?

Chlorination or other disinfection process.

- ❑ Is the contact time > 30 min?
- ❑ Are chlorine residuals checked regularly?
- ❑ Are chemicals weighed or measured accurately?
- ❑ Is the free residual entering the distribution system > 0.4mg/l?
- ❑ Are there no interruptions to disinfection?
- ❑ What is the method of dosage?
- ❑ In what form is the chlorine dosed?
- ❑ Is there safety equipment for handling the chlorine?

Slow sand filtration:

- ❑ Are the filters blocked or being bypassed?
- ❑ Is the top layer of the *schmutzdecke* being removed when required?
- ❑ What is the run time between subsequent removals of the top layer of *schmutzdecke*?
- ❑ Does the plant have facilities for washing filter sand?
- ❑ Is the turbidity on leaving the filter < 5TU?

- ❑ What is the media?
- ❑ Is the depth of sand > 600 mm?
- ❑ How long does the filter run before the removed sand needs replacing?

Rapid gravity filtration:

- ❑ Is the filter being regularly backwashed?
- ❑ What is the run time between backwashes?
- ❑ What is the backwash rate?
- ❑ Is air scour used?
- ❑ Where does the washwater go?
- ❑ Does the washwater contaminate the clean water?
- ❑ What is the media?

Clear water storage:

- ❑ Is the capacity > 1 day for demand?
- ❑ Is the tank clean, undamaged and covered?
- ❑ Are vents and overflow pipes protected by screens?

Other

Consider the process operation of any additional processes

- ❑ Grit chamber
- ❑ Oil / grease trap
- ❑ Aeration
- ❑ Pre chlorination
- ❑ Activated carbon
- ❑ Fluoridation

Process control:

Are the following being checked on a regular basis

- ❑ Turbidity?
- ❑ pH?
- ❑ Chlorine residuals?
- ❑ Jar test for assisted sedimentation?
- ❑ Microbiological (*E coli* / total coliform)?

Hydraulic operation:

- ❑ Is the flow control equipment present and functional?
- ❑ Are the process units being operated at designed flow rates?
- ❑ Are overflows being used on a regular basis?

Structural soundness:

- ❑ Is there any point of leakage in the treatment system?
- ❑ Are any of the units cracked, broken or otherwise damaged?
- ❑ Are any of the units dirty?
- ❑ Is the drainage in the treatment works area adequate?

Operation and maintenance:

Maintenance programme:

- ❑ Is there an accepted and implemented programme of maintenance?
- ❑ What does it consist of?, check off each treatment process structure and equipment (pumps, dosing equipment, etc.) are the items of equipment and structures calibrated, oiled, greased, and any damage repaired?

Chemicals and fuels.

- ❑ Note usual dosages of all chemicals
- ❑ How are the treatment process chemicals and fuels stored?
- ❑ How are the chemicals handled?
- ❑ Are the chemicals delivered on a regular basis?
- ❑ Are there likely to be interruptions to deliveries?

Disposal of spoilt chemicals and sludges:

- ❑ How are spoilt chemicals disposed of?
- ❑ How are sludges produced during treatment disposed of?

Workshop / storage facilities

- ❑ What is the capacity of workshop staff?
- ❑ How available are spare items of equipment?
- ❑ How quick are systems for obtaining additional spares?
- ❑ What is the capacity of storage facilities?
- ❑ How effective are stock control systems?

Operational management and personnel:

- ❑ Names and duties of responsible personnel, also position, training, period in job, total experience in water treatment
- ❑ How much time is spent on tasks?
- ❑ Are there enough skilled personnel to keep the plant running?

Record keeping:

Are records kept of the following

- ❑ Process control results (especially bacteriological and residual chlorine)?
- ❑ Chemical consumption?
- ❑ Problems with the treatment processes?
- ❑ Maintenance?

Health and safety:

- ❑ Are there obvious health and safety problems on the site?
- ❑ Are there facilities to cope with chemical spillage or injury to personnel? What are they?

Budget:

- ❑ Who pays?
- ❑ How much money is available? Is it adequate?
- ❑ How long does it take to get funds?

Assessment of potential for increase in capacity:

- ❑ Could the treatment works cope with further flow? How much?
- ❑ Could the works be expanded to cope with extra flow? How much? How could this be achieved?

Key references:

Hodgson and Tannock (undated)
Lloyd and Helmer, 1991
Jagour 1996
Schulz and Okun 1984
Siru 1992
UNHCR, 1996
Youde, 1996
PAHO, 1997

Conversations / observations log

Name/organization ■	**Notes** (including location and date) ■

Conversations / observations log

Name/organization ■	Notes (including location and date) ■

Addresses

Name
Position:
Organization:
Address:

Phone:
Fax:
Telex:
Email:

Name:
Position:
Organization:
Address:

Phone:
Fax:
Telex:
Email:

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Organization:
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Published information log

Publication details	Relevance
(including title, author/s, organization, date, contents, location)	

Published information log (continued)

Publication details	Relevance
(including title, author/s, organization, date, contents, location)	

Resources log

Resources:

☐ Materials and equipment ☐ Human ☐ Construction techniques and water treatment processes used

Resource	Details (numbers, cost, quality, logistical constraints where available)

Resources log (continued)

Resources:

☐ Materials and equipment ☐ Human ☐ Construction techniques and water treatment processes used

Resource	**Details** (numbers, cost, quality, logistical constraints where available)

Reconnaissance of area

(including existing water usage situation, resources and logistics)

Regional orientation

Draw a map of the area including details noted in the checklist p55

Settlement orientation

Draw a map of the settlement including details noted in the checklist p55

Demographics, present water usage and water demands

Water user numbers from affected population:

People: _____ Livestock: (large) _____ Livestock: (small) _____ Other users: _____

Water user numbers from local population:

People: _____ Livestock: (large) _____ Livestock: (small) _____

Other users: (e.g. industry agriculture) _____

Comment on reliability of figures: _____

Calculation of total water demand:

Present water sources in use: (type, location, level of service, distance to collection point). Note: The populations' own coping mechanisms should be identified and potentially built upon.

Current water consumption:

Do affected population have adequate containers for water collection?

Are the populations static or mobile?

Diseases prevalent in the local and affected populations:

Logistics (see also 'Resources log')

Condition of roads and areas susceptible to flooding and other physical threats (at present and throughout the seasons)

Security conditions (on access roads and in settlements)

Access to international freight (airstrips, ports, railways, link roads)

Airport / port handling facilities

Customs clearance procedures

Availability and reliability of freight transporters

Journey time for freight

Other logistical issues

Features of the source (excluding water quality)

Physical features including yield

Source name/ number and location and type (including grid reference)

Ground and water levels (note instrument for measurement)

Layout / dimensions (attach sketch, see p83)

Yield estimation

- volumes / flows
- variation with season
- recharge capacity

Discharges in and out (where from, where to)

Environmental features of catchment area (farming, industry, settlements, tree cover, etc.)

Is the source affected by extreme weather conditions (e.g. below 0°C)

For groundwater sources

Date Date

Test reference number

Constant yield or step drawdown test

Pump details

Method of flow measurement used

Reference point / level

Static water level

Drawdown

Specific capacity

Safe yield

Observations

Note: If a supply system already exists then refer to the *Urban water treatment works and supply system* checklist pp72-8

Draw a sketch of the source and the surrounding area

Include

- ❑ Layout / dimensions
- ❑ Ground level and water level
- ❑ Discharges (in and out, where do they come from and where do they go)
- ❑ Environmental features (river bed materials, plant and tree cover, activities in catchment area)
- ❑ Water collection points
- ❑ Current structures and source protection activities

Management, legal, security, socio-political and cultural issues

Present demands (who, what for and how much, is there competition with animals?)

Are there intermittent users such as nomads?

Who owns the land and what is the procedure to obtain permission to abstract?

Who is responsible authority for control and maintenance?

Is a tariff being charged for the water? (how much and paid to whom?)

Is the source accessible for all? (elderly, children, disabled)

Are there security problems at the source? (especially for women and children and other vulnerable groups such as opposing groups in conflicts)

Are any areas mined?

Socio - political constraints to using the source and cultural beliefs re- water provision

What are the local and affected populations' priorities for water provision?

Are there natural threats in the vicinity of the source? (cyclones, earthquakes, mudslides, etc.) What are they and what is the risk?

Features of the source (water quality)

For further information refer to:

- ☐ *Water quality assessment routines* pp148-53;
- ☐ *Catchment mapping: surveying* pp161-7;
- ☐ *Biological survey* pp204-13
- ☐ *Water quality analysis and surveying equipment* pp261-92;
- ☐ *Catchment mapping: maps and symbols* pp154-60.
- ☐ *Water quality analysis* pp169-203;

Water quality assessment summary

Water quality assessment method	**Water quality interviews for** source name/ number and location
Catchment mapping	Observations: Inference:
Local knowledge including medical information	Observations: Inference:
Sanitary investigation & observation	**Sanitary risk:** high - medium - low very low **Improved sanitary risk:** high - medium - low very low **Specific risks which can potentially be improved:** 1 2 3. 4 5 **Observations of the water source:** **Inference:**
Water quality analysis (see following page for details)	**Key findings:** ☐ Core parameters: ☐ Secondary parameters: ☐ Treatability tests: **Inference:**
Biological survey	**Species found:** Yes No ☐ intolerant ☐ slightly intolerant ☐ moderately tolerant ☐ tolerant Inference: Clean water / some minor pollution / moderate pollution / some major pollution / severe pollution **Type of pollution expected:**
Overall conclusions	**Present quality:** **Predicted variations in quality:**

Water quality analysis

	Measured value / description	Prediction of variation	Date of assessment	Test kit / method used
Core tests				
Turbidity (TU)				
Odour				
Colour				
Conductivity (µS/cm)				
pH				
E.coli / 100 ml				
Secondary tests (only test if there is an indication that there may be a problem)				
Chloride mg/l				
Fluoride mg/l				
Iron mg/l				
Manganese mg/l				
Nitrate mg/l				
Nitrite mg/l				
Sulphate mg/l				
Taste				
Arsenic mg/l *				
Permanganate Value				
Chlorine demand (of raw water) mg/l				

* Suitable field equipment may not be available for this parameter

Treatability tests

	Dosage required / time	Date of assessment	Test kit / method used
Treatability tests			
Sedimentation			
Assisted sedimentation			
pH adjustment			
Chlorination (chlorine demand of treated water)			
Other			

Industrial pollution laboratory analysis

Date sample sent to the laboratory

Address of laboratory

Details:

- ☐ chemicals added for stabilization
- ☐ storage conditions in transit
- ☐ time from sampling to laboratory analyses

Key results (attach data sheet)

Requirements for development and impacts summary

Source name, location and reference:

Technical and O&M requirements and time of set up

Technical and O&M requirements	Details	Predicted time for set-up	Potential time delays for set up / problems for set up and O&M
Protection			
Abstraction method and equipment structures			
Treatment (including raw water storage)			
Transmission distance and means of transmission			
Supply storage (if additional to raw water storage for treatment)			
Distribution			
Other (subsidiary)			
Estimated total time of set-up (items can be implemented in parallel)			

Resources and costs

	Key resources (capital and O&M)		Capital cost	O&M costs
	Material	Human		
Protection				
Abstraction				
Treatment system (including raw water storage)				
Transmission				
Supply storage (if additional to raw water storage for treatment)				
Distribution				
Other (subsidiary)				
Total costs				

Impacts of development

Potential effects of source development on the aquifer and remote sources

- ☐ Potential effects on aquifer

Effects of development on existing users of the source and local populations at the point of abstraction and downstream

- ☐ Determine: yield of source at present, new abstraction demand, existing demands, remaining yield (dry season) and the effects on existing users
- ☐ Possible compensation for local communities for the loss of yield or inconvenience
- ☐ Consider migration of people and animals / livestock to improved water sources (may be pronounced with nomadic populations) and the effects
- ☐ What are the effects on community structures / management capacity of organisations and populations?
- ☐ What subsidiary / ancillary activities are required? (training, road construction, sanitation, agricultural extension, hygiene promotion etc.)

Effects on vegetation and erosion

- ☐ What are the effects of abstraction on vegetation and erosion?
- ☐ What are the effects of migration to improved water sources on vegetation and erosion?

Effects of water treatment and waste disposal

- ☐ Increase in waste water - how will it affect levels of standing water?
- ☐ How will chemicals and fuel for water treatment be stored ?(location, security)
- ☐ How will waste chemicals be disposed of?
- ☐ How will the sludge produced during treatment be disposed of?