FINAL REPORT

Department for International Development:
Knowledge and Research (KaR) Projects

Cost Recovery in Water and Sanitation Projects

Contract No. R7384

Volume 2: Annexes to Main Report

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Volume 2: Annexes to Main Report

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ERM Reference 6278

For and on behalf of
Environmental Resources Management

Approved by: _____

Signed: _____

Position: _____

Date: _____

Annex A

Revised Logical Framework

Revised Logical Framework

Narrative summary	Measurable indicators	Means of verification	Important assumptions
Goal W1 Improved Assessment, Development and Management of Water Resources W4 Raise the well-being of the rural and urban poor through cost-effective improved water supply and sanitation			(Goal to super goal)
Purpose: To review and interpret cost recovery mechanisms across a wide range of WATSAN schemes in order to recommend a portfolio of best practices for achieving financial sustainability and maximising the potential for private sector partnerships. The investigation will focus particularly on those sectors where the client base is poorest and cost recovery is presumed to be most difficult.	Strategies are available for developing a range of context-specific forms of cost recovery and institutional arrangements able to produce financial sustainability within those WATSAN sectors currently regarded as "more risky" – e.g. rural and peri urban areas.	1. The design of (DFID) water and sanitation programmes in poorer areas become more ~~aware~~ conscious of financial sustainability and the potential role of the private sector.	(Purpose to goal) There is a recognition (by DFID) of the need for and potential of cost recovery in water and sanitation schemes; and of how design~~ing~~ for financial sustainability in schemes can involve a wider range of ownership and operation structures than the current models of ODA WATSAN programmes.
Outputs: 1. A report on what seems to make a successful rural /peri-urban water and sanitation programme or policy, in terms of financial sustainability, user "buy in" and private sector involvement. The report will contain: • The results of a survey and literature review indicating the current understanding of~~about~~ cost recovery in WATSAN projects; levels that are currently being attained; analysis of the aspects in~~of~~ project or programme design that make it work; and the extent to which demand assessment exercises play a role and are useful. • An analysis of the key attributes of case study~~y~~ WATSAN projects in India and South Africa that maximise private sector involvement and cost recovery. • A practical framework for policy or programme design that links the twin issue of demand assessment and successful cost recovery mechanisms in a way that maximises the chances of financial sustainability and private sector participation. It will be based on real project data and other existing frameworks or models for WATSAN design, and will maintain a focus on user affordability and welfare.	1. A final report is produced for DFID. Findings are disseminated within DFID. 2. Agencies, NGO's and water service operators in the key project regions are actively involved in the research process. 3. Following submission of final report, a research paper is produced for a key water event (e.g. 3rd World Water Summit; World Water Week; etc).	1.Mailing lists and key informant addresses. 2. Inception and progress reports to DFID. 2. Iterations on drafts for final report.	(Output to purpose) WATSAN project managers, NGO's, and water agencies provide information relating to strategy, targets for cost recovery, and exposure to risk.

Activities: 1. Undertake discussions, surveys and dissemination exercises with DFID, Water Aid and a range of other multilateral and bilateral donor agencies and IFI~~'~~s to develop a series of WATSAN project examples, models and frameworks in peri-urban and rural areas, related to cost recovery initiatives or demand assessment. 2. Undertake discussions with some key private sector actors to discuss the attributes of water supply and sanitation projects/wider policy environments that maximise the chances and success of their involvement. 3. Undertake a case study review of the evidence and experience (or lack) of demand assessment and cost recovery initiatives for selected water and sanitation projects in peri-urban or rural areas of South Africa and India~~.~~. Projects where the private sector has played a role~~,~~ will be particularly sought out as case studies. 4. On the basis of the findings of ~~for~~ activities 1, 2, and 3 above, develop a text for a practical and robust framework for WATSAN programme or policy design, which aims to maximise the chances of financial sustainability (cost recovery) in these difficult markets. Its replicability for implementation with the very poorest should also be considered.~~.~~ 5. Develop the draft text ~~-~~into a Final Project Report for DFI D.	Project budget.		(Activity to output)

Annex B

Economic Analyses for Water and Sanitation Programmes: The Usefulness of Cost-Benefit Analysis

B1 ANNEX B: ECONOMIC ANALYSES FOR WATER AND SANITATION PROGRAMMES: THE USEFULNESS OF COST-BENEFIT ANALYSIS

B1.1 FOCUSING ON COSTS IS THE MOST COMMON APPROACH

Finance is scarce and so evaluations to identify those water or sanitation programmes that offer the best "value for money" are important, to both Governments and donors.

WATSAN programmes and projects are most often evaluated in financial terms using some form of cost-effectiveness analysis (CEA). This means that a public policy or water supply target is set (for example, supply *x% of* households with improved services by a certain date, or increase supplies to y m^3 per year within five years) and the financial cost of meeting this objective is sought.[1]

A good policy example of where CEA may be applied can be found in one of the objectives of the Seventh Millennium Development Goal (Ensure Environmental Sustainability). Here, there is a target to *"halve, by 2015, the proportion of people without sustainable access to safe drinking water"*. However, to reach this target estimate, the finance required will range from a further US$9 billion/year (Vision 21) up to US$30 billion/year (Global Water Partnership). Clearly, the international WATSAN community regards the most cost-effective means to meet these coverage targets as an imperative which must be sought.[2]

Financial cost comparisons of WATSAN programmes using CEA are fairly straightforward to do (a comprehensive approach towards undertaking a CEA is presented below). One can envisage how donors, international NGOS and (particularly within the context of direct budgetary assistance) national governments may use CEA to compare different programme options for enhanced WATSAN coverage in order to meet the WATSAN Development Goal or some other PRS target; and how they may subsequently select various programmes on this basis.

However, although financial CEA is a practical and commonly used method for WATSAN evaluation, it does suffer from several key weaknesses.

Firstly, under CEA only an indirect evaluation of project *benefits* is made, if at all (Hanley and Spash 1993). This is a particular problem for WATSAN projects in very poor areas, as benefits (such as cost or time savings, income generation or

[1] A common additional component within the CEA process, which has emerged over the last few years, is to identify how best to use any public or ODA finance for the programme to attract or catalyse further private sector finance into the sector.

[2] The Global Water Partnership (GWP) figures suggest a need to increase investments for water and sanitation from a present level of US$14 billion/year to US$30 billion/year. These figures are given as indicative, and GWP suggests that more rigorous analysis is needed to determine more precise figures. For more details, please refer to "Financing the EU Water Initiative" ERM 2002; a paper prepared for DFID and submitted to the GWP "Camdessus Panel" on Water Financing.

environmental and heath benefits) are often difficult to quantify and can be left out of the financial evaluation process. Instead, an *economic* approach to appraisal may be better as this can capture the value of many more of the WATSAN programme benefits.

Secondly, financial CEA tends to retain a design focus on evaluating only the financial start up costs of different programme options. Less design attention in the CEA is paid to the challenge of recouping the programme's long-term recurrent costs, other than perhaps using some rule of thumb affordability assumptions about user payment flows.

Thirdly, using financial CEA alone for WATSAN appraisal means that attempts to identify the particular set of WATSAN service options, or combinations of options, which would benefit *different* sets of customers within the population, are rare. Instead, the lowest financial cost "generic" programme option is sought. As a result, the least cost option to achieve the WATSAN strategy targets may deliver much lower benefits to society - cash generation, time savings or health benefits than, say, an option which is only slightly more costly. Consequently it may be of less interest to many of its users, and they will be less interested in paying for its services.

However, as the research in the main report suggests, these key issues highlight the main aspects of WATSAN programme design for the poor that in general need more attention in the evaluation process, to achieve financial sustainability.

The box below highlights the differences between an economic and a financial evaluation and indicates why a financial cost-based analysis alone of a WATSAN programme may offer a limited basis for option selection, particularly with respect to mainstreaming the issue of financial sustainability into design.

Figure.B1

E**conomic Evaluation**

- takes account of the full costs and benefits of each option to the national economy;
- is concerned with the overall benefit to the community or region involved;
- is used to compare alternative technologies or strategies;
- is the principal tool for determining whether or not a proposed investment should be undertaken;
- is concerned with benefit and cost differences between the existing situation ('without programme case') and the situation after the new project has been implemented ('with programme case');
- is not concerned with financing charges, such as debt service requirements or depreciation provisions;
- is not concerned with the sources of funds through which the investment or recurrent costs are to be financed;
- should be conducted in constant prices and using shadow prices.

Financial Evaluation:

- is more useful to establish the sources and adequacy of funds needed to meet the financial commitments incurred in implementing and operating the preferred WATSAN project or programme;
- is usually carried out for the preferred WATSAN investment only after this has been established through the economic evaluation process;
- uses financial prices;
- is used to assess the implications of alternative investment financing and cost recovery arrangements;
- takes account of the sources and applications of all funds, including debt service requirements;
- takes account of the financial implications of any proposals for private sector involvement;
- is undertaken using current prices (that is, future prices arrived at after taking account of the projected effects of general inflation).

Hence using economic (or social) cost benefit analysis in WATSAN programme evaluation can help to focus the evaluation process on the three key issues mentioned above, thus strengthening the chances of financial sustainability.

B1.2 SOCIAL COST BENEFIT ANALYSIS

Social cost benefit analysis (SCBA) though used less frequently in WATSAN programme evaluation, seeks to compare the economic benefits of a programme with its economic costs.[1]

The aim of SCBA is to find the programme, which maximises benefits and minimises costs, thereby selecting the investment which society would most prefer (and its users will prefer to pay for). In SCBA it is the *ratio* of costs to benefits (especially over time), which becomes important. This ratio can be

[3]An economic benefit can be defined as anything that increases human well-being and an economic cost as anything that decreases human well-being. Human well-being is determined by what people prefer.

measured as the net (present) value of the project, thus allowing options for different programmes to be compared, even if their costs and benefit flows are quite different.

SCBA thus allows a range of non-financial costs and benefits (the social impacts) of the programme to be included (such as health and time savings benefits; environmental and sustainability impacts – e.g. the scarcity cost of water used). The challenge, however, is to find robust and accepted methods of monetary valuation for these non-market costs and benefits.

Thus, while SCBA may have the identification of a net value of all of the programme's costs and benefits as its general aim, it is often difficult to value *all* of the associated costs and benefits. Many practitioners highlight this problem as reason not to use SCBA but to rely instead on a financial SCBA.

This monetary valuation problem, however, does not mean that SCBA exercises should be foregone. Instead, it is practical to simply take the monetary valuation component as far as is credible and to leave the remaining potential benefits of the WATSAN programme in non-monetary terms. For example, estimates of cash savings can be included quantitatively in the benefits stream, and potentially difficult to measure benefits such as relative environmental improvements or enhanced water resources sustainability can be taken into account through detailed qualitative assessments and where possible using physical units of measurements.[1].

B1.3 HOW TO DO IT?

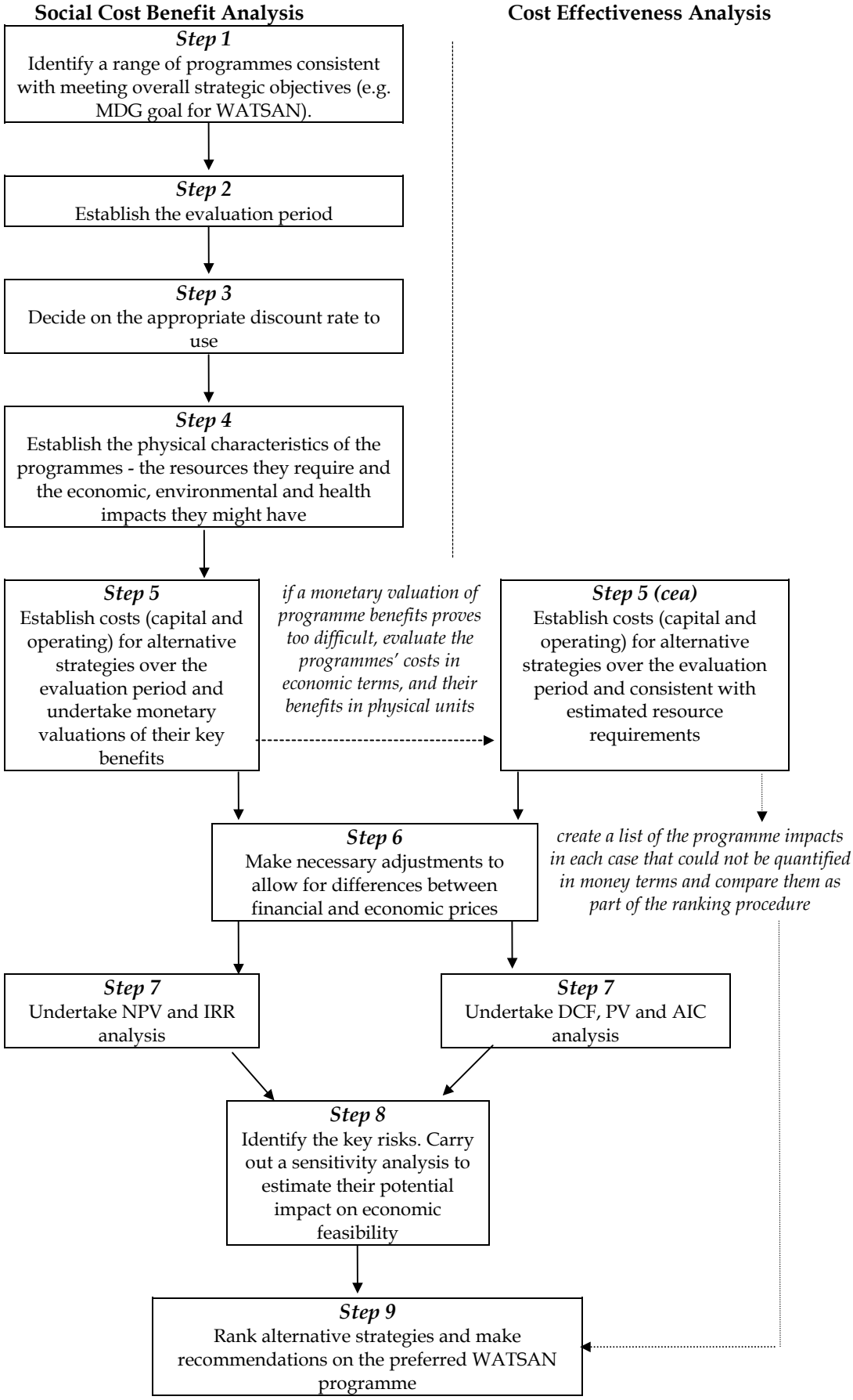
The key steps when undertaking a SCBA evaluation of WATSAN programme alternatives (and how they relate to a CEA) are outlined in *Figure B1* below. This is an iterative process, which by implication covers not only monitoring and evaluation, but also the design of strategies, programmes or projects.

It is useful to note how the evaluation process can develop if some of the benefits of the project prove difficult to quantify.

Following Figure B1, a step-by-step description of the process and terminologies used is presented.

[4]In the case of a "do-nothing" economic evaluation, of course, the costs of doing nothing (continued and worsening WATSAN supply conditions) will be listed as the intangibles, next to the cost savings benefits of not investing in the project.

Figure B2: Key steps to undertake an economic evaluation of a WATSAN programme



B1.3.1 The Key Steps in Undertaking a Social Cost Benefit or Cost Effectiveness Analysis

Step 1. Identifying a range of WATSAN programmes consistent with meeting overall policy objectives

The first step is to ensure that policy objectives for the WATSAN sector (whether through the PRS process or national interpretation of the MDGs for WATSAN) are clearly defined and that the ways of meeting those objectives, through a selection of potential programme designs have been identified.[1]

These technical proposals should then be elaborated in a way that allows all information required for the economic and financial evaluations to be obtained progressively and consistently throughout the programme development process. This allows for early feedback on the financial viability of alternative strategies.

A WATSAN programme in peri-urban or rural areas involves many inter-related elements, including:

- Water abstraction;
- Water supply;
- End of pipe delivery options;
- Sanitation;
- Safe storage and treatment of wastewater; or
- A series of networked WATSAN facilities.

The design process can therefore involve many inter-related activities that must be carefully defined and understood before the economic evaluation can proceed. It is at this point that the total resource requirements of each alternative strategy and their costs begin to be methodically assembled.

Identification of resource requirements can be assisted by the use of two tools:

- a schematic diagram to show clearly the component parts of each alternative strategy and the linkages or flows between them; and
- a table setting out the resource requirements and economic, water resource and poverty-focused impacts of each alternative strategy over the planning period.

[5]A national WATSAN programme preparation committee linked to the PRS could be a useful institution to do this, focusing perhaps on poverty reducing WATSAN investments.

Step 2. Establishing the Evaluation Period

The evaluation period or programme lifetime is normally taken to be the sum of the operating life of the longest-lived major asset created by the strategy plus the implementation period (although these can sometimes overlap). This establishes the time frame for the discounting of costs and benefits.

For example, the evaluation period of a WATSAN programme involving the construction over two years of a series of wells and sanitation schemes in a rural area, which have an expected useful life of 20 years would be 22 years. For any sanitation pits, the evaluation period should also include the period required for their safe closedown once full.

Step 3. Decide on the appropriate discount rate to use

Alternative programmes are compared on the basis of their different cost and benefit streams projected over time. Because different projects have different cost and benefit profiles (involving different cash outlays on capital and operating expenditures and different benefits occurring at different times) it is necessary to find a tool by which these variable cash flow streams can be compared.

This is done using *discounting*, a technique which translates all of the future costs and benefits into their present values. Essentially, discounting reflects peoples (or society's) time preferences, or opportunity costs of capital. Most people would prefer to have benefits occur today rather than tomorrow. Similarly, most people would prefer to deal with costs tomorrow rather than today. As a result, the present value of benefits and costs that occur today are larger than those that occur tomorrow. The *rate* at which future costs and benefits, measured in monetary terms, become smaller (are discounted) is called the discount rate.

Cost benefit analysis involves discounting both the cost and benefit streams of a project to calculate a net present value (NPV). For the programme to proceed, the NPV must be positive. Alternative projects/programmes can be compared using NPVs, the preferred programme having the higher NPV. Alternatively, another technique is to identify the internal rate of return (IRR). This is the discount rate at which the NPV equals zero.

Cost-effectiveness analysis involves discounting costs only to calculate the present value (PV). Projects can then be compared unambiguously using the same discount rate and the sensitivity of changes to the rate gauged.

No one knows exactly what the opportunity cost of capital is, although its size can be critical to the outcome of an economic evaluation. The World Bank recommends that a figure in the range 8% to 15% in real terms should be used for developing countries, although advice from the relevant national economic development agency or international financing institution should be sought. Therefore it is advisable that as part of the sensitivity analysis, the NPVs are

calculated for a range of discount rates, for example from 5% to 20%. It should also be noted that the opportunity cost of capital is not the only guide to discount rate. For example, the social time preference rate can be used as an alternative, and generally gives lower rates.

Discounting to calculate NPVs, IRRs and PVs can be easily done using spreadsheet software packages such as EXCEL on a computer.

Step 4. Establish the physical characteristics of the programmes - the resources they may use and the impacts they may have

All the impacts resulting from each programmes' implementation need to be identified. This includes estimating and listing all capital and human resources used in each of their construction processes, as well as their different effects on long term cash generation, time savings, employment, land and property prices and on their impact on the quality and sustainability of water resources, the environment and health, etc.

Two important issues here are the concepts of additionality and displacement. Additionally relates to the net impacts of the programme - what extra benefit is it going to bring, especially to the poor? For example, if the health benefits of a WATSAN strategy are being estimated, these benefits should be measured net of any other health benefits that would occur as part of the PRS without the WATSAN programme (for example from a health education campaign). Displacement relates to "crowding out" – for example, will the new WATSAN programme displace existing informal sector activities, such as water vending? If so, the costs of this displacement on peoples livelihoods also need to be included, so that the decision maker is able to weigh up all the costs and benefits of the programme to society.

Step 5: Establish costs (capital and operating) for alternative strategies over the evaluation period and undertake monetary valuations of their key benefits

For programme costs:

Identifying the costs of WATSAN programmes generally means identifying all of the financial costs associated with supplying water and/or sanitation services. These may include capital and recurring costs including technical costs, materials, labour, billing, and administrative costs, training, and so forth. There is, however, often a certain amount of confusion over the terminologies and definitions of financial costs in the water sector and thus what to aim to recover.

A useful benchmark for the clarification of financial costs of WATSAN service delivery has been made by OFWAT - the UK price regulator for water. OFWAT groups together WATSAN service delivery costs into three categories:

- Costs of Operations;

- Costs of Capital Maintenance charges; and the
- Costs of Servicing Capital (the return on capital).

An adaptation of OFWAT's definition of these financial cost categories follows, focusing on the costs of WATSAN programmes in developing countries. [1]

Costs of Operations.
Operating costs include employment costs, power costs, costs of materials and hired and contracted services. They exclude the costs of third party services and exceptional costs such as restructuring (as these can vary considerably from year to year and distort underlying trends). Costs related to assets such as depreciation and infrastructure renewals are excluded from operating costs. Capital spending and the costs of financing capital are also excluded.

Adapted from OFWAT, operating costs for WATSAN programmes can be broken down in two complimentary ways for reporting purposes – by function and by activity.

Table B1 – Suggested Breakdown of Operating Costs

Function	**Water Service**	Water resources and treatment Water distribution Programme Management Activities
	Sewerage (sanitation) services	Sanitation Treatment and disposal Programme Management activities
Activity	**Direct Costs**	Employment Power Hired and contracted services Agencies Materials and consumables Bulk Imports (water form a bulk supplier) Other
	General and support	

[6]OFWAT produces both a glossary of terms and definitions for water related accountancy; and an annual report on water and sewerage unit costs and the relative efficiencies of water companies in England and Wales. The following definitions are drawn from these reports.

	Programme management operating expenditure	Community services Associated research or dissemination services Any national taxes etc Doubtful debts Other

Costs of Capital Maintenance Charges

WATSAN service deliverers also incur capital maintenance costs to maintain the capability of their asset systems to ensure continuity of service for current and for future customers. Adapted from OFWAT, WATSAN programmes can break down their capital maintenance costs in two complimentary ways for reporting purposes. These are by operational asset classification and by accounting asset clarification.

In terms of the WATSAN related equipment and works:

- Operational assets mean mostly the above ground assets (well heads, surface distribution systems, water treatment works, local pumping stations, e.t.c). A current cost depreciation charge is applied to these assets, based on their expected economic life.

- Accounting assets mean mostly the below-ground or long-term assets (water mains and sewers and also dams and reservoirs that last a long time). They are most relevant if the WATSAN programme contains large scale capital works. For these assets an infrastructure renewals charge can be applied. This is an annual accounting provision for expenditure on the renewal of infrastructure assets, charged to the profit and loss account.

The distinction is drawn between these two ways of reporting capital maintenance charges, because of the way above ground (or shorter term) and below ground (or long term) assets are generally managed, operated and maintained.

A current cost depreciation charge means that the (above ground) assets are shown at their current cost (their replacement cost) at the time of producing the financial accounts for the WATSAN programme each year, rather than at their historic cost (their original purchase price) less depreciation where appropriate (depreciation is a measure of the consumption, use or wearing out of an asset over it's the period of its useful economic life). Current cost depreciation charges are used for the above ground assets in order to help deal with the problem of showing the effect of inflation. This is due to the extensive nature of capital assets required for WATSAN programmes,and that historic costs (the original purchase price minus depreciation) often do not reflect the asset's true worth.

Table B2 suggests a way of breaking down these capital maintenance costs for a WATSAN programme.

Table B2 - Suggested Breakdown of Capital Maintenance Costs

Operational asset classification **(Current replacement costs used to value assets)**	**Water Service**	Water resource facilities Water treatment works Water distribution mains Pumping stations Management and general
	Sanitation service	Sanitation treatment works Sludge disposal works Pumping stations Management and general
Accounting asset clarification **(Original purchase price minus deprecation charge used to value assets)**	**Infrastructure assets**	Underground systems Reservoirs Dams
	Non infrastructure assets: **- Operational assets**	Boreholes Operational Land Offices, depots and workshops Residential properties directly connected to the programme Land held for the purpose of protecting the wholesomeness of water supplies
	- Other tangible assets	Non-operational plant machinery Vehicles

Costs of Servicing Capital (the return on capital)

This is the minimum return that providers of capital (usually ODA or Government lenders) require to induce them to invest in or lend to a WATSAN programme given its risks. In this case, it is a cost the WATSAN service provider has to cover as it represents the level of remuneration the programme has to pay back to the providers of capital for the programme (a probable combination of a donor, a development bank and/or the Government). The cost of servicing capital may cover the interest repayments owed on a loan, repayments of both the interest and the principle of the loan, or a return higher than these in the form of profits delivered to equity shareholders.

The return on capital is thus the difference between the income generated from WATSAN provision (via user charges e,t,c) and the costs of the programme - both the operating costs and the capital maintenance charges. The return on capital can be influenced by the level of charges set and amounts recouped, by differing costs of capital to start with, by any gains from increased cost efficiencies that can be made, and by the timing of previous capital expenditures within the programme. The rate of return to providers of capital may also be affected by the requirement for internal funds to be put aside to finance future investments.

For programme benefits

It can be quite difficult to identify robust monetary values for some of the benefits of WATSAN programmes. However, this does not mean it should be avoided. Some of the most important aspects of WATSAN programmes in rural areas from a users point of view relate to benefits such as time saving, costs saving and health improvements. To not include them in the analysis may well misrepresent the full economic worth (or cost) of the programme. At the very least, the economic benefits of the programme - in physical units - should be listed alongside costs when considering options.

A section at the end of this annex looks into methods for calculating three common types of WATSAN programme benefit – cost savings, time savings, and health benefits, using revealed preferences.

Step 6: Make the necessary adjustments to allow for differences between financial and economic prices

It is often the case that the prices used in the evaluation of costs and benefits do not reflect fairly the value of the resources used in the production of specific inputs to the project. This is because government policies can sometimes create distortions in market prices to such an extent that they bear little relationship to real economic costs. The adjustment of these market prices to reflect the true economic cost of using the input is known as shadow pricing.[1]

Establishing shadow prices can be difficult or time consuming, although guidance and appropriate values can usually be obtained from organisations working in the country, including the World Bank and other economic development agencies. Often a simple multiplier - a standard conversion factor - can be obtained from such sources to apply to costs and benenftis expressed in domestic prices which allows for an adjustment to be made to counter any domestic/ world price distortions.

[7] The economic evaluation should also be conducted in *constant prices*. This means keeping prices constant as of a specific date, normally the year in which the analysis is being undertaken. If the price of a particular commodity (e.g. labour) is expected to rise in real terms over and above the general inflation rate, then allowance should be made for this. General inflation, on the other hand, simply raises all cash values by a given percentage and should be ignored.

Three issues commonly require the use of shadow prices, as they can often have a particularly important influence on the outcome of economic evaluations. These issues are the exchange rate, import duties and other taxes levied on imported goods, and wage rates.

These can be important issues for developing countries. It is essential that the economic analyst should ensure that the prices used in the evaluation reflect actual resource scarcities and that the preferred investment will make the best use of a country's physical resources.

Step 7: Undertake NPV and IRR analysis for CBA or PV and AIC analysis for CEA

NPV/ PV

The net present value (NPV) of a programme is the present value of the eventual benefit surplus arising to society from the programme. A calculated positive value for NPV shows the present value by which the programme has increased welfare for society. Programmes with positive NPV make society better off, while programmes with negative NPV make it worse off. Similarly, all programmes with NPVs can be ranked and the one with the highest NPV selected as best for society.

The NPV of a programme can be calculated quite simply on computer spreadsheets. In conceptual terms:

$$NPV = PV_{benefit} - PV_{cost} = \sum_{t=0}^{T} \frac{B_t - C_t}{(1+r)^t}$$

where

B = benefits
C = costs
t = time period (t_1 = year 1 for example)
r = discount rate (eg 12%)

PV

The present value (PV) is simply the discounted sum of the costs of the programme alone (or of the benefits alone). It is not a net value, like NPV, hence its use in CEA. Again, the PV of a programme can be calculated quite simply on computer spreadsheets.

IRR

The internal rate of return (IRR) is the discount rate that would produce a NPV of zero for the programme. Hence, if the IRR is greater than the base rate of interest for the country, then the programme could be seen to be a more viable investment than simply investing the programmes financial resources instead. Many agencies use a "rule of thumb" for the IRR. A good IRR would

lie between 10 and 20%. Any higher and it might appear too optimistic. Any lower and the programme could be seen to be delivering marginal benefit to society from the deployment of the financial resources in question.

The IRR of a programme can be calculated quite simply on computer spreadsheets.

AIC

Average incremental cost (AIC) analysis can be used to compare the costs of alternative strategies that provide different levels of service. AIC analysis is a method by which to establish the average unit cost of a service (e.g. average water supply costs measured in US$/m^3), a measure that can be used both for comparing programme costs and for providing a good general indication of the affordability of the proposed measures. It provides a sound basis for establishing the average tariff level needed to achieve full cost recovery from users. It is calculated by dividing the PV of a project cash flow by the PV of its associated water supply, thereby providing an estimate of the average cost per cubic metre of water provided.

It is useful because:

- It allows programmes (or programme components) to be compared on the basis of unit costs of service (a readily understandable measure);
- It allows programmes based on different service levels to be compared;
- It is an indicator of the average tariff needed to achieve full cost recovery; and
- It allows the unit costs of the investment and operating components of a programme to be calculated separately, thereby enabling the significance of each to be assessed.

Step 8: Identify the key risks. Carry out a sensitivity analysis to estimate their potential impact on economic feasibility.

A decision on the preferred WATSAN programme should be taken only after each alternative has been subjected to a thorough sensitivity analysis based on an identification of the key risks to which it is likely to be exposed. These can take a number of forms, but important ones are:

- The possibility of cost over-runs;
- Components taking longer than projected to implement;
- Water supply volumes being higher or lower than projected;
- Certain key benefits being higher or lower than expected; and

- Operating costs being higher than projected.

The sensitivity of outcomes to changes in the discount rate should also be assessed.

Sensitivity analysis involves calculating the effect that changing the values assigned to key parameters, costs and benefits has on project outcomes (such as unit costs per m^3) and hence on the rank ordering of projects. One approach is to compare the effect of a percentage change in a variable, such as a 20% increase in capital costs, on the rank ordering of project options.

Another approach is to calculate 'switching values'. A switching value is the percentage change in a variable needed to bring about a specific outcome, such as the percentage change in capital costs needed to switch the rank order of project alternatives. The likelihood of a change of this magnitude can then be assessed.

The box below shows possible ways of presenting the results of sensitivity analyses based on these two approaches.

Box B3 Example Presentation of the Results of a Sensitivity Analysis

(a) Sensitivity of rankings to changes in key variables (for alternative strategies yielding identical benefits)

Rank Order	**Alternative Strategy 1**	**Alternative Strategy 2**
Base case	1	2
20% investment cost over run	2	1
Operating costs increased by 10%	1	2
Discount rate reduced from 10% to 5%	2	1

(b) Switching values (cost >\$3/m^3)

	Alternative Strategy 1	**Alternative Strategy 2**
Increase in investment costs	15%	30%
Increase in operating costs	50%	40%
Increase in discount rate from 10% to	14%	12%

Step 9: Rank alternative strategies and make recommendations on the preferred strategy

Once the economic evaluation and sensitivity analyses have been completed the alternative programme strategies can be ranked, according to their NPVs if a CBA was used, or their average costs per m^3, if a CEA was used. A final decision can then be made taking into account all other relevant factors.

Importantly, if the findings from a CEA approach are presented, the non-monetary costs and benefits of the options should also be clearly listed alongside each cost/ per m^3 finding.

B1.4 CALCULATING BENEFITS

B1.4.1 Introduction

Key benefits from WATSAN programmes for very poor people can commonly be identified as:

- Cost savings;
- Time savings and convenience; and
- Health improvements.

A practical way to measure each of these benefits, based on people's actions (their *revealed* behaviour), is presented here.

B1.4.2 Cost savings benefits

A *cost savings benefit* could take the following approach:

- Assume that the water provided by the new and/or rehabilitated programme will exactly substitute for all currently purchased water – i.e. assume a vertical demand curve for water; or
- Assume that the programme would aim to supply enough *extra* water per household to meet existing needs and to allow an increase in water consumption to a safe/ comfortable level - i.e. there will be a small consumer surplus related to the increased supply as well as the cost savings.

Methodological Approach

Hence, there are usually two types of cost savings scenarios to calculate benefits for:

- Where there is not assumed to be an increase in water quantity supplied, the estimated cost savings is simply calculated as the original "higher" price for water minus the new "lower" price for water, multiplied by how much water people actually buy; or
- Where there is assumed to be an increase in water quantity supplied, a *demand function* for water use is estimated and the consumer surplus associated with the increase in quantity is calculated. This is then added to the cost savings component to give a cost savings benefit estimation.

In reality, several different demand curves could exist for different water uses within and between households. To derive a demand function (or series of functions) from observed data would be a very difficult exercise to undertake given the time and resource limitations that often exist. Instead, it is recommended a standard functional form for the water demand relationship be assumed.

A very useful reference on this topic is *Dale Whittington and Venkateswarlu Swarna "The Economic Benefits of Potable Water Supply Programmes to Households In developing Countries". Asian Development Bank, Economics and Development Resource Centre. January 1994.* They recommend that a Power (Log linear) functional form for the water demand relationship is assumed, where $Q = a\ P^{-b}$; and where Q is water consumption, P is the price of water and a and b are constants.

With this assumption in place, the calculation of the cost savings component involves five steps overall:

1. Determining the shadow price (or real resource cost in terms of money, effort e.t.c.) of a unit of water to households (m^3) before the programme is constructed (P_1). Find a robust average purchase price for water, perhaps obtained by a survey or participative discussion. To change this financial price to an economic price a conversion factor can be used.[1]

2. Estimating the shadow price of water (P_2) to households after the programme is constructed. P_2 should be developed on the basis of a level of desired cost recovery for the new programme, ideally a unit cost that reflects at least all costs of operations and the costs of capital maintenance (see Section 2.3 in the main text).

3. Estimating the quantity of water households are using before the new water supply systems are built (Q_1).

4. Calculating the cost savings per household. This is achieved by multiplying the difference in the shadow price of water before and after the programme (P_1 - P_2) by Q_1.

These four steps are enough to estimate the cost savings component. Where there is also a slight increase in quantity assumed another, more complex, stage is required - *Step 5.*

[10]Note that, although the focus of the cost-savings benefit approach is the benefits and costs of a unit of water to the programme's water users themselves pre and post project, it is also important to recognise that any such shadow price should also reflect a *wider* scarcity value (an opportunity cost) for a unit of water to society in the region pre and post project. However, an inclusion of this opportunity cost into the pricing regime can only be achieved through implementing policy mechanisms, including water rights trading, which are by default wider than the WATSAN project being scrutinised by the SCBA. Section 2 in the main report discusses this issue further.

5. Estimating the consumer surplus on the increased quantity of water used.

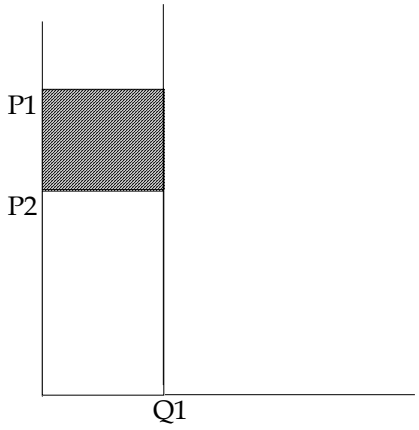
To estimate the consumer surplus, a forecast of the quantity of water to be used at price P_2 is also required. This figure (Q_2) is necessarily arbitrary and is itself constrained by the feasibility of the new water system.

The first figure for Q_2 is literally the same as Q_1 - representing simply a "switch" from vended to cistern water. It means that there has been no quantity increase, only a cost saving; hence, no consumer surplus calculation is required (see *Scenario 1*).

The second figure for Q_2 represents a rise in volume supplied to allow for each household member to consume more water (see *Scenario 2*).

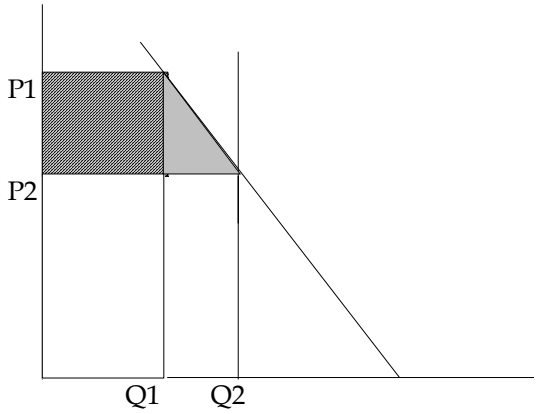
Given the two points (P_1, Q_1) and (P_2, Q_2) and the assumption of a demand function of $Q = a P^{-b}$, a demand curve for water for the programme's population can be defined over the relevant range of values of Q. To obtain an estimate of the consumer surplus under the demand curve between these two points, the ratio of the consumer surplus to the cost savings benefit is determined and then multiplied by the cost savings. This approach relates the magnitude of consumer surplus to the cost savings, yielding separate estimates of each. It is known as the *c factor* approach (Whittington et al 1994).

Scenario 1: The "switch value" for stated water purchases only



In *Scenario 1* we assume supply (Q1) is constrained - the programme can only supply an exact substitute of the quantity of water people say they buy. P1 is the expensive vended water price/m^3; P2 the lower programme water price m^3 - a per annum recurrent cost, for example. Scenario 1 represents a cost savings calculation alone, with the cost savings component represented as the hatched area.

Scenario 2: Increasing the substitution of stated water purchases to allow for higher consumption.



In *Scenario 2,* we assume that, in addition to substituting the amount people say they purchase, the programme also supplies an extra amount to allow for higher consumption. Hence, the benefits estimation calculates the costs savings of *Scenario 1* plus the small consumer surplus related to the increase in quantity to Q2. This consumer surplus is presented as the grey triangle to the right of the cost savings component. It is important to note that there is also an assumption that P1 falls to P2 under this scenario (i.e. the overall net economic cost the water users face in obtaining a unit of water is lower as a result of the intervention, including a rise in any scarcity of water that may result).

(Both axes in the figure presented as scenario 2 have logarithmic scales).

Calculating the consumer surplus

The assumption of $Q = a P^{-b}$ for the demand curve for water implies that the price elasticity of demand for water is a constant at all levels of water use within the surveyed households. Although this is at best a crude representation of household water demand behaviour, it allows us to provide a reasonable approximation of the actual demand behaviour, which may occur as the households move from expensive vended water to more reliable and slightly more plentiful WATSAN programme water.

To calculate the consumer surplus, we aim to calculate the area under the inverse demand function between P_1 and P_2 minus the cost savings component. The c factor approach does this by multiplying the cost savings by the ratio of the consumer surplus to the cost savings. The product of the multiplication of the cost savings and the c factor is thus an estimate of the magnitude of the consumer surplus.

The c factor = consumer surplus/ cost savings.

Thus

$c = 1/ \{1-b \times [(P_1Q_1 - P_2Q_2) / Q_1 (P_1 - P_2)]\} - 1$ *(equation 1)*

We need to find a value for the constant *b.*

The demand function is represented by $ln\ Q = ln\ a - b\ ln\ P$

We have values for P_1, P_2, Q_1 and Q_2.

Therefore:

$ln\ Q_1 = ln\ a - b\ ln\ P_1$
$ln\ Q_2 = ln\ a - b\ ln\ P_2$

and

$$b = (ln Q_2 - ln\ Q_1) / (ln\ P_1 - ln\ P_2) \qquad \textit{(equation 2)}$$

Substituting equation 2 back into equation 1 allows us to calculate the c factor. We then multiply our cost savings values by the c factor to obtain an estimate of the consumer surplus in each case and for the aggregate.

B1.4.3 Time savings benefits

A similar approach can be used to calculate time savings benefits.

Water programmes may lead to economic benefits in the form of time savings when they bring safe water supply closer to the home and so reduce the time of fetching water. Indeed, many participants may mention the time savings issue as one of the key potential benefits of a WATSAN programme.

To estimate these benefits requires collection of data on the amount of time households spend per day collecting water, the amount collected and the monetary value of time spent fetching water.

For example:

- Currently, households spend on average one hour per trip fetching a bucket of water. They collect three buckets per day. Each bucket holds approximately 20 litres.

- With the programme, households will spend on average ten minutes per trip fetching a bucket of water. They will collect up to six buckets per day.

- Within a household, the total water fetching time breaks down into 60% of the time being spent by women collecting water, 30% of the collection time spent by men and 10% spent by children.

- To calculate the cost of this labour input, a valuation of the opportunity cost of time spent on water collection to equal the rural unskilled wage rate can be considered appropriate. Following discussions, an appropriate wage

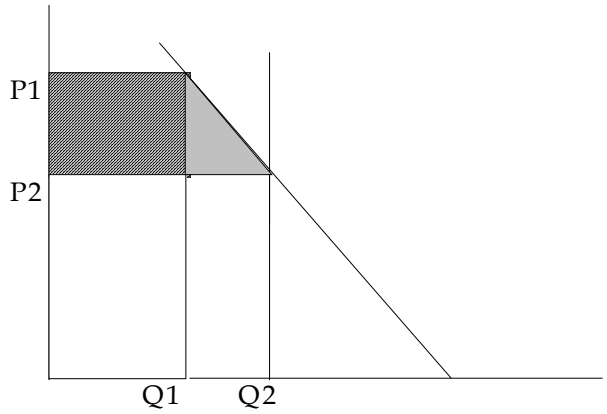
rate for women and children per day can be identified in relation to this wage rate; for children, for example, it maybe taken to be a quarter of that.[1]

A calculation of total time savings benefits may also require an estimate of the number of households that are expected to switch to the new system. Every household in the participating community may be expected to switch to the closer new programme WATSAN system.

However, as well as enjoying a time savings benefit as a result of proximity to water, participating households may also use *more* water as a result of the programme. Thus, and similar to the cost savings estimate above, the time savings benefits estimation also needs to incorporate an estimate of the *consumer surplus*. *Scenario 3* presents this issue conceptually.

Scenario 3. Time Cost Savings and the Consumer Surplus

Price/ Cost of Collecting Water



Quantity of Water Collected

(Both axes in scenario 3 have logarithmic scales).

Before the programme, it cost more in time (P1 = 1 hour per trip) and so households collected less water (Q1 = 3 buckets per day). After the programme, households find that it costs less in time (P2 = 10 minutes per trip) to fetch water and so collect more water (Q2 = 6 buckets per day).

To calculate the cost of time saved per household (the grey striped shaded area), we multiply the difference in the shadow price of water before and after the programme (P_1 - P_2) by Q_1.

[11]Identifying the shadow price of labour has enormous complications. Rural wage rate observations are often made at periods of high agricultural activity, not in the slack season and this can tend to raise the shadow price above its true level. Hence, the shadow price for labour in CBA is usually a downwardly modified version of the observed market price for rural labour, converted to an economic price. This is rarely zero, however, as people's time is usually seen as having some sort of opportunity cost, not least perhaps in the form of domestic tasks that allow others to undertake wage work.

However, the *total* timecost savings benefit is the cost of time saved *plus* the extra benefit gained from the increased amount of water consumed (the grey triangle). The grey triangle is called the *consumer surplus*.

As there is an increase in water quantity consumed as a result of the programme, a *demand function* for water use is estimated and the consumer surplus associated with the increase in quantity is calculated. This is then added to the time-cost savings component to give a more representative time-cost savings benefit estimation.

B1.4.4 Calculating the Consumer Surplus

As before, it is recommended that a functional form such as $Q = a P^{-b}$ for the water demand relationship be assumed.

To calculate the consumer surplus, we aim to calculate the area under the inverse demand function between P_1 and P_2 minus the time-cost savings component. The c factor approach does this by multiplying the time-cost savings by the ratio of the consumer surplus to the time-cost savings. The product of the multiplication of the time-cost savings and the c factor is thus an estimate of the magnitude of the consumer surplus.

As in equations 1 and 2 above, substituting equation 2 back into equation 1 allows us to calculate the c factor We then multiply our time-cost savings values by the c factor to obtain an estimate of the consumer surplus for a typical household.

The time-cost savings benefit plus the consumer surplus for each household can then be aggregated for a typical community and then for the number of communities the programme aims to work with.

B1.4.5 Health Benefits

Methodology

Although attributing health benefits to water and sanitation programmes is extremely difficult and their monetary estimation can be even more difficult, it is often felt that some investigation of the health benefits of a programme are useful. This is because WATSAN programmes often place a large emphasis on health and hygiene education, as well as on improving water supplies.

A first step to valuing health benefits, is to calculate the tangible costs of medicines, transportation costs to clinics e.t.c, which can be identified in the PRA for example.. These costs can be very significant, especially where large distances exist between villages and health services.

In addition, the number of productive (wage earning) days lost or saved as a result of (avoiding) illnesses can be valued as health costs and benefits. One of the most attributable links between improved water, hygiene and health can

be found in the reduction of diarrhoea cases per year. A conservative estimation of health costs and benefits can thus be linked to productivity lost (or saved) from diarrhoea cases (avoided) each year as a result of a water and sanitation programme.

For the purposes of a case study example, imagine that the local Health Bureau and programme staff felt that, before a pilot programme, each person in the programme region generally suffered from two diarrhoea cases per year, each case lasting about five days. Assuming two-thirds of diarrhoea cases affect children, it can be assumed that there are approximately 1.34 "children cases" and 0.66 "adult cases" of diarrhoea per person in each community per year, with no water and sanitation programme present.

The Health Bureau then reports a reduction in diarrhoea cases as a result of the WATSAN pilot programme by 80%. To maintain a conservative estimate, this statement is halved. Hence, the benefit analysis assumes a 40% attribution rate of reduction in diarrhoea cases as a result of the programme.

The productive days lost per year from diarrhoea cases for adults and for children can then be calculated for each community. This can be done for a *with* and *without* pilot programme scenario. Productive days for children focus on those children of school attending age who do not attend school, but who undertake productive work for the household instead. About 30% of children of school attending age in the region are estimated to be not attending school, but working in the household. It is only these children, and the working days they lose to diarrhoea each year, that the child-focused part of the benefits calculation focuses on.

The monetary valuation of productive days lost (or saved) from diarrhoea related illness each year for adults and those working children can then be aggregated for a typical sized community and for the number of communities the WATSAN programme aims to work with.

It must be stressed that these monetary estimates of health costs/ benefits would be conservative and *do not* include an estimate of the opportunity costs of caring. Some non-monetary costs can also be highlighted from this analysis, including infant days of illness from diarrhoea (avoided) and child school days missed (or saved) through (the reduction of) diarrhoea related illnesses.

B1.4.6 Willingness to Pay Surveys

The discussion thus far has focused on the use of revealed behaviour and actual market data to calculate the benefits of water supply improvements. In the Position Report, considerable attention was paid to the clarification of the links between the Demand Responsive Approach (DRA) and the issue of willingness to pay. It was noted that these concepts were somewhat muddled.

Specifically, criticisms of the notion of demand responsive services appeared to include common criticisms of the method commonly used for direct

elicitation of willingness to pay, the contingent valuation method. To recap, there is a general consensus around the desirability of demand responsive projects. But this consensus seems to break down when the corollary issue of payment (i.e. household financial obligations) was introduced into the story in the form of household willingness to pay. We attempted to clarify the willingness to pay versus ability to pay debate, a sidetrack which we perceive to have handicapped the progress in the development of methods to elicit household preferences and a more complete measure of household valuation of water service improvements. The integration of demand and willingness to pay methods into service planning is still at an early stage, but there are a number of good examples that show how survey methods can be used in the project cycle. An important observation for planners to consider is the cost of finding out about demand/willingness to pay information relative to the total investment cost of the project.

The rationale for using DRA in WATSAN programme design is provided in an overview by Katz and Sara.

- T. Katz, and J. Sara. *Making Rural Water Supply Sustainable: Recommendations from a Global Study* UNDP/World Bank Water and Sanitation Program, **http://www.wsp.org/pdfs/global_ruralstudy.pdf**

Good introductions to the contingent valuation method and its use in WATSAM programme design are:

- Whittington, D. (1997) *Administering Contingent Valuation Surveys in Developing Countries, World Development*, 26(1), pp1-10.

- Altaf, M.A. and Hughes, J.A. (1994) *Measuring the demand for improved sanitation services: results of a contingent valuation study in Ouagadougou, Burkina Faso, Urban Studies*, 31(10), pp1763-1776.

- Altaf, M.A., Jamal, H. and Whittington, D. (1992) *Willingness to Pay for Water in Rural Punjab, Pakistan*, UNDP-World Bank Water and Sanitation Report No.4, World Bank, Washington DC.

A case study example of using contingent valuation to feed into the benefits estimation of a SCBA for a WATSAN programme can be found in:

- Waughray, DK and Moran, D. *Water Benefits in Dryland Areas.* In Pearce, D.W (ed.) (2002) *Valuing the Environment in Developing Countries: Case Studies.* Edward Elgar, ISBN 1 84064 148 7 pp 1114 – 129.

This case study is available electronically on request from the authors, who are happy to talk through the step-by-step process of undertaking the CV survey.

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Annex C

Literature Review

C1 LITERATURE REVIEW

C1.1 INTRODUCTION

A literature review was undertaken at project start, October 1999. This concentrated on a review of papers, reports, overviews and conference proceedings about demand assessment, willingness to pay and cost recovery. The review focused particularly on the debate about whether or not to use DRA techniques and the application of the "water as an economic good" concept to WATSAN projects and programmes. Much of the WATSAN literature of the 1990s addressed these debates.

Since 1999, however, there has been a proliferation of interest, particularly from the Work Bank, on issues relating to investments in infrastructure services, regulatory polices, private sector participation and their combined effect on the poor, especially in peri-urban and rural areas. Literature reviewed from the later 1990s and 2000 onwards reflects these themes, which are now often at the forefront of the WATSAN debate.

There has also been output and follow up to the World Water Summit in the Hague, September 2000, which heralded the beginning of a return to a discussion about social entitlements and subsidy in the WATSAN provision debate. Other issues, such as water supply within a livelihoods context, and the emergence of the concept of output-based aid, and its relevance to WATSAN delivery in rural areas, have also emerged during the research period.

It should be stressed, however, that we do not consider our literature review to be comprehensive, but rather an overview of the key issues in the cost recovery debate in WATSAN projects. Furthermore, as the WATSAN and development policy literature is constantly being added to and updated, any review necessarily becomes a historical snapshot in time, as soon as it is undertaken. This review is no exception unfortunately. Since 2001, there have been several initiatives and publications relating to financial sustainability in the WATSAN sector, which are not featured in this review.

The review has been structured along the following lines. Firstly, an overview of the key issues in relation to the debate about cost recovery in WATSAN projects has been undertaken. This section includes some of the interpretations of (financial) sustainability in the WATSAN sector, as well as highlighting the debate between demand versus entitlement conceptual approaches to WATSAN provision.

Secondly, the review looks at demand assessment for WATSAN projects in more depth. It gives an overview of some of the key issues underlying demand assessment, as well as methodologies for assessing demand.

Lastly, the review looks at the approaches for recovering costs in WATSAN projects and programmes. It is divided into a review of tools (tariffs, subsidies, micro-finance initiatives) and models (decentralisation, private sector participation, community-based organisation, pro-poor regulation, output based approaches and livelihoods approaches).

C1.2 COST RECOVERY AND FINANCIAL SUSTAINABILITY

C1.2.1 Interpretations

Our review identified a range of interpretations on the challenge that cost recovery and financial sustainability presents WATSAN projects. For example:

- DFID - Financial sustainability requires that the system is at least able to meet its capital, operating and maintenance costs to ensure that WATSAN services and interventions continue to operate satisfactorily and generate benefits over their planned life.

- Business Partners for Development – The costs associated with WATSAN projects include the cost of providing infrastructure; the cost of connecting a household to the system; and the cost of operating and maintaining the system. While cost recovery is important for sustainable project delivery, it cannot be looked at in a vacuum. Sustainability in WATSAN projects is multi-faceted – technical, institutional and financial sustainability are all important. The cost recovery challenge for any project is to find the right balance between these elements – a service that a household wants, is willing and able to pay for and does pay for; and an operational and institutional system that is capable of collecting these contributions.[1]

- IRC[2]: The key factors contributing to sustainable cost recovery in WATSAN projects and programmes, can be subdivided into seven categories:

    - Setting a strategy
    - Improving willingness to pay
    - Optimizing costs
    - Establishing clear financial responsibilities
    - Setting an appropriate tariff
    - Improving access to alternative finance
    - Organizing effective financial management

- DANIDA[3]: Successful cost recovery is a key component in the attainment of sustainable water supply services. All improvements require money and other resources, not only for the initial infrastructure, but also for recurrent costs such as operation, maintenance, repairs and replacement.

[1] Komives and Stalker-Prokopy, 2000.
[2] Brikké and Rojas, 2000.
[3] Snijder and Syme, 1998.

- Water Aid[4]: The ability of a community to keep a water point operational over a long period of time is a complex mix of managerial, social, financial, and technical issues and the capabilities of the institutions and infrastructure designed to support the community. To make matters more complex, each of these elements are often inter-linked and inter-dependent.

- World Bank[5] – The principles of cost sharing and community responsibility for meeting capital costs, operational and maintenance costs should be clearly spelled out from the outset. The cost sharing arrangements negotiated should depend on the level of service for which the community is willing to pay – the higher the cost of service, the greater the community share. Special emphasis should be placed on responsibility for sustaining investments. Rules should be spelled out about asset ownership, operation and maintenance and ongoing recovery of capital cost.

Three core issues emerge from the range of interpretations on cost recovery we looked at.

1. Firstly, that at least costs of operations and costs of capital maintenance charges should be recovered to be financially sustainable, but ideally part ial payment of the costs of servicing capital should take place too. One off subsidies are tolerable.

2. Secondly, local institutions, policies and a people-focus are as important as the level of charge in order to achieve cost recovery in a WATSAN project; and

3. Thirdly, that some form of demand assessment and financial assistance can help in the setting and repayment of the correct level of service charge.

C1.2.2 Conceptual Approaches – DRA versus entitlements

Until the 1990s and UNCED, the review found that need, especially in relation to health, tended to be the chief criterion for matching communities to WATSAN projects. Historically, technologies were supplied by donor agencies on the basis of assumptions made about consumer's preferences. However, from the mid 1990s onwards, project implementation in the water and sanitation sector started to reflect the principles established at the *International Conference on Water and the Environment held in Dublin in 1992* and subsequently endorsed at the *Rio de Janeiro UNCED Conference in 1993*.

These core "Dublin Principles" include the following:

- Effective management of water resources demands a *holistic approach* linking social and economic development with protection of natural ecosystems.

[4] Sugden, 2001.
[5] Garn, 1998

- Water should be recognised as having an *economic value* in all its competing uses.

- Water development and management should be based on *a participatory approach*, involving users, planners and policy makers at all levels, with decisions taken at the lowest appropriate level.

A further condition attached to the Dublin Conference referred to *the provision of a minimum amount of water at an affordable price*.[6]

Although the pronouncements of the Dublin Conference on the treatment of water as an economic good did not provide a consensus viewpoint among water analysts about the definition of the term (see McNeill 1998; Perry *et al* 1997)[7], the declarations were seen as the start of a conceptual framework for thinking about financial sustainability in WATSAN programmes.[8]

Thus, and subsequent to the Dublin Declarations, many publications, conferences and debates occurred, which discussed the implications of treating water as an economic good. [9]

Importantly, in 1998, the World Bank produced a note entitled "*Managing Water as an Economic Good"*, by Mike Garn.

In this note, the concept of a Demand Responsive approach (DRA) was put forward. DRA was an approach to WATSAN that attempted to respond to consumer demands and which aimed at making projects more sustainable than supply-driven approaches. Garn listed the following as key characteristics of DRA:

- Community members make informed choices about:
  - whether to participate in the project;
  - levels of service, based on willingness to pay;
  - when and how their services are delivered; and
  - financial management and management of O & M;

- Governments play a facilitative role;

- An environment enabling private (and NGO) participation is created; and

- An adequate flow of information is provided to the community.

Garn also suggested that in order for DRA to work effectively there needed to be competition among communities for funding, in order to decide whether to provide support to a particular community and what type of system and level of service to provide.

[6] International Conference on Water and the Environment, 1992; Briscoe, 1997.

[7] McNeill, 1997; Perry et al, 1997.

[8] J. Winpenny, 1997; Carter et al, 1999.

[9] For example, J. Winpenny (1994) ; Kay et al (eds) , 1997.

For many NGOs, however, this competitive aspect of the DRA debate was fundamentally flawed – how could poor communities compete and pay for WATSAN projects? To these stakeholders, DRA represented the problems that seemed inherent to them both in declaration to "treat water as an economic good", and in the methods for finding out how much people were willing to pay, such as contingent valuation. For proponents of the DRA approach, however, entering into this debate was seen as critical in order to move the sector away from the minimum level of service, supply oriented approach reliant on affordability rules of thumb, which Garn criticised.

A study by the World Bank that conducted extensive empirical research between 1987 and 1990 was used to back up the DRA argument.[10] This study found that household income, though often important, was not the overriding determinant of demand for improved WATSAN services. The following three factors (in no order of importance) were found to be significant:

- socio-economic characteristics: household income, gender, education, occupation and assets, among other local demographic characteristics;

- characteristics of supply: the relative merits of the proposed water supply (over the existing source), particularly relating to cost, quantity, quality and reliability; and

- household attitudes towards government policy in the sector and towards other organisational representatives with whom local citizens deal with.

However, despite this debate, there remained little practical agreement (or conclusive evidence) indicating how sustainable cost recovery strategies could be ensured over time for WATSAN projects, or how they were to be defined. Conceptual camps tended to emerge between the DRA/ World Bank approach to WATSAN and the more "rights-based" approach.

The second World Water Forum was held in The Hague in March 2000. Partly as a result of the debate between the DRA and rights-based camps on WATSAN, among many other issues, the debate and the subsequent Ministerial Declaration on Water for the 21st Century was slightly different to that of the Dublin Declaration. It stated, on valuing water:

"to manage water in a way that reflects its economic, social, environmental and cultural values for all its uses, and to move towards pricing water services to reflect the cost of their provision. This approach should take account of the need for equity and the basic needs of the poor and the vulnerable."

And on meeting basic needs:

"to recognise that access to safe and sufficient water and sanitation are basic human needs and are essential to health and well-being, and to empower people, especially women, through a participatory process of water management."

[10] Briscoe et al, 1993.

There is a clear shift away from the DRA agenda in the statements from the Hague, toward a more rights based approach for WATSAN delivery.

The third World Water Forum will be held in March 2003 in Kyoto, Japan, where again this issue will no doubt be re-visited; however, it does seem that the findings and arguments that the DRA agenda put forward in the late 1990s remain pertinent to the cost recovery debate and could provide part of the solution, when one is trying to identify "what works" vis-à-vis financially sustainable WATSAN projects and programmes.

C1.3 DEMAND FOR WATSAN SERVICES

C1.3.1 Demand Assessment

The literature generally sees demand assessment as crucial for the correct determination of consumer preferences.[11] If it is assumed that consumer preferences are a function of costs, other variables and varying qualities and quantities/levels of water and sanitation provision, then it is important for demand to be assessed accurately as unsatisfied demands for water and sanitation provision can make a project unsustainable.[12] Importantly the literature also suggests that demand assessment may highlight the need for a *mixed level of service*, to reflect both users differences in demand, and seasonal variations in geophysical conditions.[13]

The World Bank Global Study on Water and Sanitation found that, although technology choices should be linked to prices so that communities understand how their payment is determined, most projects, which were reviewed, *did not* make this link explicit. The result was that many household members perceived their contribution as a tax. This World Bank study also revealed that it is important to give communities follow up information on project management, especially operation and maintenance so that they can understand the level of tariffs. In many cases, therefore, it seems that communities *do not* perceive that they face an economic trade-off for a higher level of service. And it is exactly this issue that demand assessment aims to resolve.

Poor people can pay

There are many sources of information on the range of water demand curves that exist for consumptive uses. The literature agrees that, in reality, several different demand curves could exist for different water uses within and between households. To derive a demand function (or series of functions) from observed data for all of these uses would be a very difficult exercise to

[11] J. Briscoe, 1996; Carter et al, 1999; World Bank-UNDP Community Water Supply and Sanitation Conference, 1998.

[12] Perez de Mendigueren, 1998.

[13] Webster, 1998.

[14] B.Copeland, 1995; Perez de Mendigueren, 1998.

[15] R. Carson 1999.

undertake given the time and resource limitations for any standard project feasibility study. Instead, in general, a *Power (log linear) functional form is assumed for the demand curve for water*. This implies that the price elasticity of demand for water is a constant at all levels of water use within households. Although this is at best a crude representation of household water demand behaviour, it allows economists to provide a reasonable approximation of people's actual demand behaviour. [14]

This is an important assumption, as it suggests that WATSAN designers should assume that demand for water is related to income for the poor. However, as the World Bank found, household income, though often important, was not the overriding determinant of demand for improved WATSAN services. A log linear relationship between demand and price/ cost for water, therefore, may be a misleading oversimplification.

Conversely, there are many references to both the willingness of poor people to pay for WATSAN services, and the often-costly coping strategies that they endure to access WATSAN services, as evidence of the fact that they often pay high prices. Literature from the UNDP-World Bank Water and Sanitation Programme provides a good overview of both these issues.[15]

Productive uses of water are important

Attention has turned to looking at peoples *productive uses* of water as well. These uses can range from vegetable gardens, cattle farming activities to traditional beer making activities. Surveys conducted in villages in South Africa on the uses of water, indicate that there is a high economic value for water (up to 40 litres beyond the basic consumption level), which is accounted for mostly by productive, or economic activities. Other work has found that the daily per capita amount of water used for productive activities is more than double in villages with better access to water supplies. And importantly, the sustainability of the system depended on these demands being met. [16]

In general, the most highly rated benefits are water reliability and water security.[17] These benefits can be of particularly high value if they are seen in relation to the scheme's perceived usefulness to assist in other income generating activities within the household. [18] Combined with this, is the ability to provide capacity for all consumption uses into the future – i.e. to meet *future* as well as present demand. Often more people will return to a village or a region, if the water sources become more reliable. Conversely it has been found that water shortages or unreliability of service will, not surprisingly, decrease the rate of payment for water services.[19]

[16] Whittington et al, 1994.
[17] UNDP, 1999; Bhatia et al, 1993.
[18] Perez de Mendigueren, 1998.
[19] Garn M, 1998.
[20] Waughray et al, 1999; B. Rihardjo et al, 1994.

Notional and Effective Demand

A key finding of the literature review is an identification of a difference between notional and effective demand, and how this may help to improve the use and understanding of assessing demand to design more sustainable WATSAN projects and programmes.

Sen (1981) illustrates effective demand by considering a shop selling food in a famine area, where many people cannot afford to buy the food. The need for food is great, but only a few people can buy it, therefore, effective demand for food is small [(20)].

Pearce (1981) defines effective demand as the "aggregate demand for goods and services which is backed up with the resources to pay for them...distinguished from 'notional demand' which refers to a desire for goods and services." [(21)]

Credit or other financial assistance and the type of payment structure on offer, can help to translate notional into effective demand, rendering affordability or rule of thumb analyses less useful. These differences may be of central importance to the WATSAN debate on financial sustainability.

For example, for poor people in rural /peri-urban areas, the marginal utility of money is high (people value hard cash highly), incomes tend to be low or insecure, and often people pursue a wide range of livelihoods whereby their wealth is tied up in a number of assets, and not just in disposable income. A large part of the literature (especially Government policies) has therefore focused on the fact that poor people cannot or should not pay for WATSAN services. However, many studies have also shown that poor people do in fact, often pay a high price to access WATSAN services, just to cope. A range of other studies have also suggested poor people are willing to pay for improved WATSAN services. And there are also many examples of rights-based WATSAN projects, which have found that innovative ways of paying for water such as through savings groups, revolving funds etc can be useful - the way the payments are designed can also influence how much people will pay.

These studies seem to be contradictory. Rural /peri urban people are poor and value their cash greatly. They have to pursue many strategies to survive. And yet they will still pay a lot for water in relation to their income, or will be influenced to pay by project designs, contrary to what an affordability study may have suggested.

Hence in theory, the effective WTP of the consumer can be fixed, but if they have access to other assets (labour, livestock, credit, savings schemes) and if the design of the project particularly suits them, then their notional demand may be quite high. If the right mechanism can be designed and implemented to translate their notional into effective demand for WATSAN services, therefore, then they will be willing and able to pay beyond their observed and immediate income constraint.

Is this what successful, demand focused WATSAN projects and programmes have done to deliver financial sustainability?

C1.3.2 Methodologies for Demand Assessment

Demand assessment methodologies can be classified into:

- *direct methods* such as the Contingent Valuation Method (CVM), and
- *indirect methods* such as the observation of existing payments for, or efforts taken to obtain, water services (revealed preference studies).

Carson (1999) has recently provided an accessible users guide to CVM.[20]

Whittington (1994) provides a clear methodological guide for using indirect methods, particularly revealed preference techniques - the costs savings benefit approach - for measuring the demand for water.[21]

However, in terms of *directly* assessing community preferences, the literature debates whether CVM, or the use of participatory community meetings, are the most practical or accurate method available. There are only a few studies that compare CVM results with *actual* behaviour and none were found which compared the results of community meetings with actual choices. In a study that looked at WTP results using both CVM and participatory meeting techniques, there were significant differences in the socio-characteristics of the samples. This can lead to significant differences in policy conclusions.

Furthermore, historical, socio-economic and cultural factors may also compromise the ability and/or willingness of rural people to engage in CVM exercises. In addition, the time and resources needed for a contingent valuation survey may not always be appropriate for small community projects.

The literature suggests that the advantage of community meeting techniques is that the additional discussion generated by groups of individuals should increase the quantity and quality of information available to those participating. This additional information should reduce the hypothetical bias associated with CVM. On the other hand, there is also a debate that the threat of strategic behaviour might increase during community meetings if participants realise that they might benefit from exaggerating or mis-stating their preferences.

DFID also recommends the following demand assessment techniques, which can be used:

- Participatory Rapid Appraisal (PRA) facilitated by community members (for low cost, low-tech options).

[21]Whittington et al, 1994.

- PRA facilitated by a trained researcher (suitable for most technologies and can be complemented with other approaches).

- Revealed preference approaches are suitable where substantial water problems exist, in conjunction with PRA models.

- CVM can be used for informal strategic decisions on level of service, cost recovery policy and large investment programmes.

- The 'benefits transfer' approach, under which results in one location are used to estimate benefits in a 'similar' location is *not* recommended.

DFID recommend that a choice of technologies and associated prices should be given to communities. However, this approach may not capture notional demand, and therefore risks essentially providing a supply side oriented design process, whereby the change agent (DFID) decides upon the community's demand for a variety of service options.

We note in passing that the demand assessment literature draws heavily from developments in the field of environmental economics. A recent methodological evolution in environmental valuation with relevance to demand assessment in developing countries is the use of a technique called *contingent ranking*. This direct approach differs slightly from contingent valuation in the use of option packages that are ranked by respondents rather than the statement (or rejection or acceptance – depending on the question format) of a willingness to pay value. The option packages in the context of water/sanitation supply would consist of a matrix of service or supply attributes (e.g. communal, yard or private connections), levels of service and an associated price or tariff associated with each combination of attributes a respondent might select.

The contingent ranking approach draws heavily on the conjoint analysis method used widely in marketing studies to launch a new product with appropriate "demand driven" attributes. We suggest that this method could be part of any social marketing study to both raise awareness of the benefits of supply options, *and* make explicit the price/level of service tradeoffs households and communities must consider. To date no applications of this approach are available.

However, the most challenging aspect of the demand debate seems to relate less to the ways of assessing demand in theory, and more on how to implement the policy in practice, so as to design financially sustainable projects in a cost-effective manner.

C1.3.3 Using demand assessment to design cost recovering projects

IRC carried out some recent research to identify key factors that contribute to sustainable cost recovery in the context of community managed water supply services. The seven key factors for sustainable cost recovery are briefly

highlighted below (Brikke & Rojas, 2000):

- The community should be assisted to set a clear strategy for cost recovery that articulates the concepts of equity, efficiency, participatory process and capacity building.

- Factors influencing Willingness-To-Pay (WTP) for water services should be identified and improved upon accordingly. It is a prerequisite that the WTP should be estimated as accurately as possible.

- Costs of water supply services should be optimised through a process of identifying, estimating and analysing the costs, choosing appropriate technologies and service options that are affordable to low-income communities, establishing the optimal cost recovery level, and minimising operation and maintenance costs.

- Financial responsibilities for the community and other stakeholders should be clearly specified, well documented and distributed to the relevant stakeholders.

- The scope of a tariff should be established and an appropriate tariff set.

- Alternative sources of funding for community water supply schemes should be explored to supplement cost recovery through water tariffs. Possible alternative sources include community financing, private or co-operative funding, targeted subsidies, general water levies, soft loan mechanisms and grants.

- Developing an effective financial management system through effective budgeting, billing, revenue collection, bookkeeping, financial monitoring and control. These elements can be strengthened through capacity building of the responsible members of the community.

These seven steps broadly concur with earlier suggestions as to the key variables that determine whether demand assessment leads to sustainable financial projects:

- Tackling affordability and associated income generation issues, as well as identifying effective demand;

- The methodology used to elicit willingness to pay values and the translation of demand assessment information into design and tariff decisions;

- Demand variances within the community; and

- The financial management capacity of the community.[22]

DFID's guidelines do not differ significantly from these same general viewpoints concerning critical factors for financial sustainability of WATSAN projects. DFID criteria include the following:

- Understanding local priorities and preferences for water and sanitation services, as well as formal and informal power structures;
- Providing different (or at least flexible) levels of service and technologies according to the different willingness to pay amounts of the community;
- Setting charges for services at levels which generate sufficient income to cover operation, maintenance and replacement costs;
- Enhancing hygiene promotion programmes to stimulate demand for water supply, sanitation and waste disposal facilities;
- Ensuring that the correct financial and technical training is given to the community;
- Ensuring that the technical, institutional and budgetary needs of consultation and decision making are catered for in the planning, design and implementation phases; and
- Enabling private sector agencies to offer support services where this is more efficient than public sector.

C1.3.4 Occurrence of demand assessment in the Project Cycle

At the earliest stage in the project cycle, most agencies identify their WATSAN projects from country sectoral strategy and country programmes.

Many development agencies agree that the identification of specific communities for water and sanitation provision may be the most important step to project design. [23] However, the issue of identifying demand to ensure financial sustainability tends to be side-stepped slightly, and instead agencies identify appropriate communities that they can work with, early in the project cycle, perhaps at the pre feasibility stage. For example, indicators that can influence the selection of communities are leadership, organisation capability, and successful completion of other community projects. [24]

However, some examples also exist where affordability analyses, or in some cases willingness to pay studies, have been used to select communities at an early stage in the project cycle. They include the following:

- In a World Bank-UNDP project the financial policy gave priority to those communities paying more than the minimum 20 per cent of the capital cost.

[22] Ruhardjo et al, 1994.

[23] ibid.

The level of community contribution was higher than the requirement of 20 per cent and the average has been 28 per cent.

- The Mvula Trust, an independent organisation providing water and sanitation services in South Africa, identifies communities to work with by requiring that communities demonstrate their organisational capacities. Before Mvula commits to funding the project, the community must put together a feasibility study. An up front contribution is required from the community.[25]

- The Rural Water Supply and Sanitation Transition Demonstration Project, largely funded by DFID, requires that communities initiate their own proposals which specify the level of service they want and for which they would be willing to pay. The proposals are assessed on a competitive basis, employing criteria that establish minimum conditions to be met but that also allow communes to 'bid-up' their proposed contribution.

- Current joint policy in Vietnam between UNICEF and CERWAS for water and sanitation projects (a Vietnamese government body for water and sanitation) stipulates that communities must contribute 20 per cent of the capital costs of their water systems. On a pilot basis communities have repaid 100 per cent of capital costs in regular instalments over a number of years.

- A water and sanitation project run by CARE selects communities on the basis of willingness to pay and ability to pay.

In general however, although there is a consensus as to the usefulness of measuring people's demand for WATSAN projects, there seems to be little agreement on how and where in the project cycle demand assessment techniques should be used.

DFID states that demand assessment is important at both the policy stage of the project cycle and at the project identification, preparation and appraisal stages. In larger more complex systems, there will be a need to develop institutional capacity for continuing demand responsiveness. Demand assessment should be carried out in the early stages to establish broad parameters of demand to inform strategic design decisions. In later stages of the projects cycle, a more detailed costing will inform tariff structure design decisions.

However, again, the problem seems to be in the rigorous methodological implementation of this policy, rather than in agreeing on the principles behind it.

[24] World Bank-UNDP. (1999) Community Water Supply and Sanitation Conference.

C1.3.5 Affordability

Importantly, a World Bank study shows that the sustainability of WATSAN projects depends on whether communities are chosen on the basis of needs or demand. The study suggests that demand is not well correlated with affordability indicators and cannot be well predicted on the basis of income alone.[26]

Some agencies such as the Asian Development Bank and DFID [27] recognise that the 5 per cent affordability indicator (the assumption that people would be willing to pay 3 to 5 per cent of their income on water) is arbitrary and recommend that affordability studies be put in the context of consumer coping mechanisms and water payments.

In general, the literature shows that willingness to pay (WTP) has proven to be a more successful indicator of demand than ability to pay. For example, a WTP study in Nigeria reports WTP values that are 18 per cent of incomes for rural low-income households.[28] Some studies have shown higher WTP for poorer households, compared to a standard of around 2 to 3 per cent spent on water services among high-income households. These results indicate that rural communities may prefer service levels above the minimum often prescribed and that rural or peri-urban water and sanitation projects may not actually require extensive government subsidies.

The literature also suggests that the reliance on ability to pay studies derives from the fact (or belief) that WTP analyses, with their preference for using hypothetical markets, ignore the actual financial constraints the household faces. Further, WTP by women in particular may not be even close to their ability to pay, because of their lack of control over household incomes. [29]Also, the pro - affordability lobby suggest that the unreliability and variation in household income are important in determining the affordability of water and sanitation systems. Consequently, flexible water services such as seasonal water vending systems are seen as better able to suit situations where incomes or resources vary over time. [30]

However, the debate about the need to identify notional demand through the use of WTP or other community-based studies remains a persuasive one, in order to break the cycle of low levels of supply orientated service, and low expectations. Although it remains common for subsidies to be given to cover the difference between notional demand and affordability (if notional demand has been identified), other more sustainable approaches to help meet effective demand are emerging in the literature, such as the linking of income generation activities or the use of micro credit, as components that can create more demand oriented and sustainable water and sanitation projects.

[25] Garn, (1998) DFID 1999 Guidance Manual on Water Supply and Sanitation Programmes.

[26] Wittington et al, 1991.

[27] Evans, 1996.

[28] Wittington et al, 1989, 1990.

DFID's policy on affordability, however, is slightly contradictory in relation to its encouragement to assess demand. Although it agrees that affordability "rules of thumb" have been shown to be a poor guide to WTP for WATSAN service improvements, it does suggest that affordability should be interpreted on a case-by-case basis.[31] Hence, the identification of notional demand for WATSAN services is potentially subsumed by the recommendation to explore more affordable (and therefore supply orientated) options for the community.

C1.4 APPROACHES FOR RECOVERING COSTS

This section of the review is divided into a review of tools (tariffs, subsidies, micro-finance initiatives) and models (decentralisation, private sector participation, community-based organisation, pro-poor regulation, output based approaches and livelihoods approaches)

C1.4.1 Tariffs

In general, the literature agrees that an efficient tariff policy should be one that reflects the marginal economic costs of supply.

The literature also agrees, however, that tariffs can commonly be used as instruments of social policy, such as the redistribution of income based on equity concerns. For example, connection fees can be kept low to prevent entry being deterred and often charges can be subsidised for some period. [32] A commonly observed approach in urban environments in developing countries is to use a tariff schedule that consists of a low subsidised "lifeline" rate for the first 6-8 m^3 per month, and a higher rate for all additional consumption. More complex tariff schedules with multiple increasing blocks, sometimes in proportion to the recorded income distribution of the country, are also relatively common. [(33)(34)] However, some literature suggests that water utilities are likely to find it difficult to limit the size of the initial block for residential users due to political pressures. Data from the Asian Development Bank shows that the first tariff block is nearly always set for a larger quantity than is dictated by basic water needs. [35]
The problems associated with pricing water in rural, agricultural [36] and peri-urban areas are highlighted by an IRC-UNDP project that assessed how far the Dublin principles had been followed. The study showed that progress with tariffs in line with the Dublin principles is greatest in urban areas where metering is more common, compared to other contexts, where the consumer base is more difficult to define. [37]

[29]DFID 1999 Guidance notes for DFID economists on demand assessment in the water and sanitation sector: Annex B – Contracting demand assessment studies.
[30]Winpenny, 1997.
[31]Warford, 1997.
[32]Boland et al, 1997.
[33]Ibid.
[34]It is estimated that 91% of total water consumption in developing countries is used in agriculture. (fin 4)
[35]http://www.irc.nl/home/wrmp/wrmpdc01.htm

However, and as mentioned already, since most water is consumed by a relatively small number of consumers (large residential, commercial and industrial users) a marginal cost based price for all consumption over that required for basic health purposes would generally be an efficient, equitable and financially viable policy. [38]

Where metering is possible, the literature seems to concur that a two-part tariff is an improvement on increasing block tariffs as it can achieve the intended income distribution element required and eliminate the within-block regressivity of an increasing block tariff. The first part is a capacity charge that determines a user's maximum usage during periods of excess demand plus any other fixed costs. The second part is a usage price equal to marginal cost. The two-part tariff confronts most households with the full marginal cost of supply. [(39)(40]

Optimal designs for water tariffs will of course vary with the varying nature of water resources. Where the opportunity cost of water resources is low (demand is below supply, currently and in the future) the fixed costs of water system are high compared to the variable costs. The costs of metering and usage based billing are thus high compared to the cost of water and meter installations may not be worth the cost. However, for those areas where the opportunity costs of water resources are high, metering is more likely to be worth installing. [41]

In order to satisfy equity and financial objectives, it is generally recommended that communal standpipe users be charged a tariff linked to the operation and maintenance of a basic level of service (also considering affordability) and individual connections be charged the average incremental cost of the operation and maintenance, depreciation and capital cost of supply. [42]

Some commentators argue that a more holistic approach to water supply and sanitation - using an integrated water resource management policy for example - may be a more productive way to build truly sustainable financing strategies into peoples water tariffs, because user charges for water often do not currently include a pollution cost element. [43]
DFID suggests that the use of cross subsidies, lifeline tariffs and rising block tariffs are all part of the same strategy to include equity objectives into cost recovery. In addition, water connection costs can be eased for low-income households by subsidising the costs or allowing the connection fee to spread over a longer period.

[36]Warford, 1997.
[37]Boland et al, 2000.
[38]Noll et al, 1999.
[39]Ibid.
[40]Yepes, 1998.
[41]Evans, 1996.

C1.4.2 Subsidies and micro finance

The 1999 World Bank – UNDP global study on making rural water supply sustainable[44] found that, although there is widespread agreement that users must be responsible for operations and maintenance, there might be circumstances where subsidies are acceptable. For example, there may be conventional economic reasons for subsidising water or sanitation services, such as the presence of external health benefits, which may be compounded by a lack of awareness of health issues.

Consumers may not value water quality highly enough because of information imperfections relating to, for example, the relationship between water quality and health. With low awareness levels consumers may respond to higher prices for piped water by consuming too much low quality water from other sources. Some development agencies propose to correct this by subsidising some minimum amount for human consumption. The need to subsidise consumers may also be indicative of a wider problem regarding, for example, price reforms.

In fact, the literature suggests that there are many reasons why water and sanitation suffer from price distortions. Commonly, treating water and sanitation as social instruments for the wider objective of rural development or alleviating macro-economic inefficiencies may lead to the *second best problem*. [45] If inefficient conditions prevail in other areas of the economy, for example, the price of labour is below its economic cost, then consumers are not able to pay for water. National priorities on food security may lead to inefficient water pricing practices for the agricultural sector. In most developing countries, for example, charges for irrigated agriculture have been much lower than those required even to pay for operation and maintenance. [46]

Consequently, the literature review found that few rural finance schemes are thought to be fully self-sustaining and organisationally sustainable, and an external subsidy may often be needed to cover training, administration and start up (capital) costs. [47]

Furthermore, the review found that the subsidy ceiling could be the most critical element of a sustainable financial policy.[48] The per capita ceiling on capital grants has been instrumental in ensuring sustainable financial rules in the Mvula programme. Conversely, perverse incentives may occur with expressing subsidies as a percentage of the capital cost of each option. The option with the highest subsidy may be chosen on the basis of it being the biggest capital contribution to the community. [49]

[42]The World Bank- UNDP 1999 Making Rural Water Supply Sustainable: Recommendations from a Global Study.

[43]Warford, 1997.

[44]Biscoe, 1996.

[45]Overseas Development Institute, 1997.

[46]Dean, P. and Khohar, G.H. (1998) WEDC Conference.

[47]World Bank-UNDP (1999) Community Water Supply and Sanitation Conference; A Summary

In peri-urban areas, the review found that cross-subsidisation policies can fail to provide incentives to the utility to bill or collect from many users at the low end of the tariff spectrum, thus aggravating cash flow problems. In fact, social tariffs may create disincentives to expand services to low-income areas. [50] Unrealistically high rates to industrial and commercial users can force them to look for alternative supplies, thus reducing market share and, in the process, exacerbating the cross subsidy problem. [51]

In relation to lifeline or rising block tariffs, the poorest often have to obtain water through shared connections, from neighbours with connections or from water vendors. If several households use the connection the group quickly exceeds the volume in the initial block, pushing water use into the higher priced blocks. This problem occurs also with water re-sales from households with private meter connections from water vendors. Under such pricing policies, the poor incur the excess costs charged to the household from the vendor, in addition to any surcharges the household wishes to impose. Under these circumstances, the poor are at the mercy of the rich, who are able to afford a connection. Meanwhile, the poor spend a much higher percentage of their income on basic water supply.

However, it also appears that a reliable correlation between water consumption and household per capita income is difficult to establish and there may be, in fact, more efficient ways of redistributing income than through water supply tariffs. Since most water is consumed by a relatively small number of consumers (large residential, commercial and industrial users), a marginal cost based price for all consumption over that required for basic health purposes would generally be an efficient, equitable and financially viable policy. [53] Alternatives to subsidising water tariffs in peri - urban areas, therefore, could be the use of marginal cost pricing for water plus a cash subsidy for the poorest, which is unrelated to water use. [54]

However, it is also important to know the total cost of the intervention for which the subsidy is partly given. The IRC suggests that a low cost intervention and a subsequently low subsidy per household are important pre requisites for system sustainability. [55] How this finding relates with the need to try and access people' s notional demand, however, is not clear. The solution may lie in the terms of any additional credit given to the user, to help pay back a loan for a WATSAN intervention.

[48]World Bank Private Sector Note 188.

[49]Yepes, 1999.

[50]Warford, 1997.

[51]Ibid.

[52]Brikke, F. and Rocas, J. (2000). Seven key factors for sustainable cost recovery in the context of community managed water supply. IRC Occasional Paper. International Water and Sanitation Centre, Delft, Netherlands.

This ties in with other current research on subsidies, which indicates that where a government decides that a subsidy is appropriate, then it is usually preferable to subsidise access to a service rather than consumption.[56]

DFID's approach to subsidies for water supply schemes is that they should be justified on income redistribution grounds, and not on direct health benefits. DFID suggests that subsidies for sanitation may be needed to correct for 'market failures', which arise because effective demand does not lead to the level of investment in those sanitation services which would be most efficient for the economy and society. This policy, in fact, reflects the argument stated earlier for identifying the notional demand for WATSAN services, and then finding a viable selection of financing instruments to help the community pay for them. However, in this case, DFID advocates the use of subsidies at present.

Sanda and Oya (1998) suggest that better access to micro-credit should reduce the gap between service affordability and consumer's WTP and help low-income households afford the longer term options. However, designing an appropriate incentive compatible form of credit scheme seems to be instrumental in stimulating disadvantaged groups to initiate income generation activities and to enhance their group solidarity.[57]

Some practitioners in the water and sanitation sector believe that sustainable financing strategies for WATSAN projects actually require the complementary development of micro-credit and savings mechanisms to build a source of financing to pay for improved levels of services and operation and maintenance - that the financing issue should be considered in the wider context of poverty eradication, for both sanitation and water services. [58] These practitioners feel that credit binds people to repayment and leads to growth and sustainability of the system. [59]

By linking the issue of capturing notional demand to the design of a reasonable standard of WATSAN service supply, supply can become financially sustainable. DFID's position on this area, however, is relatively weak. The closest DFID policy statement this review could find on the linkages between credit and meeting the effective demand for WATSAN services, comes from the 1998 Guidance Manual. It suggests that demand assessment studies can help in the design of payment mechanisms that are appropriate for poor people. They can identify, for example, people's preferences for weekly as against monthly payments, or for credit arrangements to spread over time the capital casts of connection fees.

(56) Evans, 2002.

(57) Sanda et al (1998) .

(58) Evans, 1996.

(59) World Bank-UNDP Community Water and Sanitation Conference, 1999.

C1.4.3 Decentralisation

The survey found that there is an increasing realisation that governments must make the transition from being a 'provider' of services to becoming a 'facilitator'. National agencies should be responsible for financing, long term planning, standard setting and technical assistance. Compatible legal frameworks and a clear division of responsibilities and mandates within the water and sanitation sector are needed.[60] Well-defined contracts and an appropriate level of regulation are also needed to ensure efficient operations by the private sector.[61]

Although the survey found that private sector participation could also assist in the provision of demand driven services[62], it now appears clear that specific attention to the needs of demand driven services for poor people should be explored from the outset of contract and regulatory framework design. If this does not happen, then there is a risk that the resulting regime actually creates further barriers to the provision of such services.[63]

For rural areas, many water sector studies recommend that the only sustainable approach to managing water supply and sanitation is that where community management models manage their own water and sanitation supply systems.[64] However, this can be difficult in cases where the legal and regulatory frameworks have not formalised the status of such organisations. This can create very practical difficulties for such organisations, especially if they are tasked with collection of tariffs and financing of maintenance, without a clear legal entity allowing them, for example, to open a bank-account.[65]

In general, the survey found that the particular management model adopted for WATSAN projects seems to impact significantly on the level of demand. Communities may distrust a national government's capacity to manage the operation and maintenance of water and sanitation projects efficiently, and consequently their demand for such projects decreases. Willingness to pay for investment costs has been found to increase dramatically when communities, rather than government agencies, have control over how funds are spent.[66] The 1999 World Bank-UNDP Rural Water Supply Global study found that per capita costs were lower where there were higher community contributions and when construction contracts were managed by NGOs rather than government agencies.

(59) http://www.who_int/water_sanitation_health; http://wsscc/vision 21/docs/docs27.htm

(60) Franceys, 1997.

(61) Johnstone et al, 1999.

(63) Evans, 2002.

(63) Katz et al, 1998; Moriarty et al, 2001.

65 ERM research as part of preparation for the World Bank publication "Lessons in Private Provision of Rural Infrastructure Services" financed by the World Bank Public-Private Infrastructure Advisory Facility (PPIAF).

(65) World Bank-UNDP 1999 Making Rural Water Supply Sustainable: Recommendations from a Global Study; Wittington et al, 1990.

The literature also suggests that strengthening property rights in illegal settlements can also provide low income households with a greater incentive to switch from day to day purchases to longer term sources of supply. [67] This may also be essential to allow private operators to offer services in such areas, in some cases this is expressly stated in private sector contracts.[68]

Consequently, a review of community management experiences for natural resources (including water) has found that their success seems to depend on four factors associated with the resource and the user group:

- A small and clearly defined resource;
- A close proximity between the resource and users and a high level of dependence on the resource;
- A small and defined group of users, having established arrangements for discussing common problems. Groups must be small enough to ensure good communication and low cost monitoring;
- High noticeability of cheating on arrangements and high costs of 'exclusion' technology.

Also, the more homogenous the community the greater are the chances of a successful common property regime developing.[69] This point was highlighted by a water supply project in Uganda where the size of catchment area (and the heterogeneity of its population) for the project was seen as too large to be sustainable. [70]

In summary, the review found that the types of decentralisation support needed by communities to help sustain their own WATSAN project management services are:

- Legal and institutional frameworks that recognise community water management groups and provide a clear division of responsibilities;
- Training to develop community capacity for operation, maintenance and financial management;
- A strong system for the provision of technical backup. [71]

In relation to sanitation services in particular, constraints to successful implementation in rural and peri-urban situations were identified as*:*

- The nature of the community (degree of homogeneity, power structures);

(66)World Bank Private Sector Note No 188, 1999.
(68) BPD, 2002.
(68) Evans, 1996.
(70) Copeland, 1995.
(71)Saywell et al, 1998.

- The community's relationship to the government agencies;
- The administration (transaction and co-ordination) costs of intra-community negotiations;
- The administration costs of negotiations between community and government agencies;
- The manner in which willingness to pay for services (demand) is established and how this is related to post programme performance;
- The costs of production of services to the community and the government; and
- The evidence of systematic resistance to the partnership arrangement. [72]

C1.4.4 Regulation

As well as policy, a key issue in relation to the implementation of cost recovering WATSAN programmes for the poor is regulation. Specifically for this study, two key questions in relation to regulation are:

- Does independent regulation have a role to play in the improved provision of demand driven WATSAN services for the poor?
- What is the potential of pro-poor regulation for cost recovery?

A key reference on this topic has recently been produced by Tremolet and Browning (2002) as part of the Water and Sanitation Cluster for the Business Partners for Development Initiative. [73]

A role for pro-poor regulation?

The study suggests that independent regulation is most often introduced with large-scale private sector participation, when the potential for monopoly abuse is perceived to be high. However, such independent regulation also provides an opportunity for increasing the demand responsive nature of service provision for the poor:

- It is possible to give an independent regulatory body a clear remit to preserve the long-term interests of the poor versus short-term political prerogatives.

(72) Evans, 1996

73 Tremolet and Browning (2002) *The Interface between Regulatory Frameworks and Tri-Sector Partnerships,* Business Partners for Development Water & Sanitation Cluster Research and Surveys Series http://www.bpd-waterandsanitation.org/english/docs/regulationpn.pdf

- Independent regulatory bodies tend to be more flexible to adapt to changes in demand, unforeseen circumstances and changes in operating conditions than an overly rigid contractual framework or a bureaucratic self-regulation regime.

However, to date this opportunity has not been fully capitalised upon, as in most cases independent regulatory agencies are not given a clear pro-poor remit nor are they aware of the demands of poor customers. Therefore, current research focuses on developing a concept of pro-poor regulation and overcoming the challenges that implementing such regulation presents.

The concept of pro-poor regulation

Tremolet and Browning (2002) suggest that regulatory functions in the water and sanitation sectors can be broadly divided into three categories: economic, environmental and public health. The implementation of each of these functions can lead to an adverse impact on poor customers. By identifying these impacts, it is possible to develop a concept of pro-poor regulation.

Box 1 Regulatory functions and the poor

Economic regulation

Economic regulation is itself comprised of three functions: price regulation, service quality regulation and competition regulation.

- ***Price regulation -*** *Price regulation consists of setting overall tariff levels and tariff structures so as to ensure delivery of services at an affordable cost while ensuring the long-term financial viability of the sector.*

  Price regulation can explicitly take into account the needs of the poor by setting tariff levels on the basis of how much the poor are willing and able to pay and for which level of service, introducing pro-poor tariff structures and allowing more flexible payment methods. One key aspect of pro-poor price regulation is to introduce incentives for the private sector operator to provide services in poor areas, which might be costly to serve or less accessible. (74)

- ***Service quality regulation -*** *Service quality regulation entails defining levels of service on product characteristics such as technical requirements or customer responsiveness.*

  Pro-poor regulation may allow service providers to offer variable service levels in different service areas to adapt to local conditions, by contrast to blanket quality standards that raise the costs of water and sanitation services to the poor. In addition, the setting of coverage targets can be essential for increasing access by the previously unconnected poor, which often represent the great majority of poor water service consumers.

- ***Competition regulation -*** *Competition needs to be regulated under various forms: first, to monitor competition for the market (in the case of a monopoly provider) and also, to ensure competition in the market where applicable, and thus to encourage private sector investment on a fair and competitive basis.*

  Competition regulation usually focuses on ensuring that the main service provider is protected by exclusivity rules in a given service area. By contrast, pro-poor regulation may wish to encourage a reasonable amount of competition from alternative service providers (such as water vendors) given that they provide important service options to the poor.

(1) However, regulatory institutions' ability to affect tariff levels would often depend on political decisions, with the poor being willing to pay but the politicians often unwilling to charge.

Regulation should seek to preserve a level-playing field between all types of operators in order to preserve choice between service options for poor customers.

Environmental regulation

Environmental regulation in the water sector broadly consists of regulating water abstractions and discharges so as to manage resources in a sustainable manner. Abstraction and discharge rights are often ill defined in developing countries, where water extracted from the ground or from rivers tends to be taken for granted and environmental costs are seen as nobody's problem.

The poor are usually the first ones to suffer from a deterioration in the resource situation, since they tend to be the last ones to be served and the impact on their living environment can be much more significant. By contrast, environmental standards may be set too high compared to what the poorest can afford. Setting high standards may also be a way of granting monopoly rights to the private operator, thereby reducing service options for the poor.

Public Health regulation

Public Health regulation is usually performed independently of the water sector, except for the specific function of drinking water quality regulation, which is a key determinant of the quality and therefore, of the price of water services.

As with environmental standards, high water quality standards can result in prices set beyond the means of poor customers, whereas insufficient monitoring of drinking water quality affects the poor most, as their financial means to pay for coping strategies (e.g. boiling water, filters) are much less.

Overcoming the challenges of pro-poor regulation

In order to implement pro-poor regulation, the regulatory agency needs to possess a thorough understanding of poor customers, specific skills in order to be able to gather and analyse information, dedicated human and financial resources and the institutional flexibility to respond to the needs of the poor.

These issues need to be taken into account when designing regulatory and institutional arrangements(75) for service delivery, and deciding upon how such institutions operate in practice (See *Box 2*).

Box 2 Pro-poor regulation in practice(76)

Pro-poor regulatory institutions are unlikely to be able to achieve pro-poor objectives without close interaction with other agencies and the poor. However, at the same time such institutions need to maintain independence and transparency. Tri-sector partnerships have been identified as a potential mechanism for allowing regulatory institutions to interact with other agencies and the poor, without jeopardising their independence and transparency:

- Partnerships can help gather information on the needs of the poor and make it available for regulation.
- Partnerships may serve as a secondary recourse and communication mechanism for customer's complaints and issues particularly relaying poor customer's interests.

(75) For example, , PPIAF/ADB Conference on Infrastructure Development - Private Solutions for the Poor: Asian Perspective http://www.ppiaf.org/conference/docs/Papers/Regulation.pdf

(76)Tremolet, S. & Browning, S. (2002), The Interface between Regulatory Frameworks and Tri-Sector Partnerships, Business Partners for Development Water & Sanitation Cluster Research and Surveys Series http://www.bpd-waterandsanitation.org/english/docs/regulationpn.pdf

- Partnerships can create a more flexible, innovative and cooperative environment for developing rules better suited to the needs of the poor, particularly through the implementation of pilot projects.

The potential for pro-poor regulation for cost recovery?

The BPD study suggests that independent regulation has the potential to improve the long-term success of cost recovery policies:

- Firstly, an independent regulator provides the institutional means to effectively implement and monitor the progress of a cost-recovery policy, shielded from political interference.

- Secondly, competition regulation can establish a level-playing field for the main utility and alternative providers. The entry of such alternative providers can extend coverage to new areas, or increase collection rates, thus aiding cost-recovery objectives.

- Thirdly, price regulation can develop price and tariff structures that maximise cost-recovery, minimise subsidies and maximise provision of services to the poor.

- Fourthly, quality regulation can allow for service level differentiation between categories of providers and/or consumers. Allowance for different standards can increase cost-recovery levels, by reducing the costs of service provision.

C1.4.5 Private sector participation

The literature is generally agreed that public utilities do not have the financial or political autonomy to set tariffs at levels that recover costs.[77] Private sector participation in WATSAN projects and programmes is therefore seen as the most efficient way of ensuring financially sustainable pricing policies[78].

Current research is focusing on how regulatory and legal frameworks, in addition to contracts can be formed so that large-scale private providers of water and sanitation services effectively deliver water services to the poor, whilst ensuring that the sector's financial viability is assured.

The following issues appear to be key:

- The needs of the poor should be central to any private sector reform process;
- The assumption that poor customers are high risk, low return customers should be challenged, which may require a significant information gathering exercise;

(87) N Johnstone and L Wood, 1998.
(78) Franceys, 1997.

- The problems of informal settlements should be directly addressed;

- Innovative ways to address technical problems should be actively encouraged; and

- The distance between the provider and poor customers should be reduced.[79]

Many commentators feel that small-scale private sector (or currently informal) inputs can play a role in resolving some of these issues. If these operators are responding to expressed and identified demand, then in doing so, cost recovery will be *de facto.* For example, recent studies suggest that entrepreneurs in water and sanitation, responding to local conditions and competing for market niches, can offer a wide and flexible range of water supply options - residential re-sales, for example.

In general, the most viable private sector participation options for rural and peri-urban communities are seen as the following:

- *Community contractors.* They can help foster community empowerment and ownership of the project, but do require social development and technical support.

- *Small-scale contractors and suppliers.* These agents can help to develop private enterprise in the water sector.

- *Water and sanitation related NGOS.* These organisations can provide social development assistance and the small-scale management contracting of systems. [80]

However, it may be difficult to combine the short time-scales within which the private sector operator may be required to work, with the longer time-scales of demand led approaches. One solution is to formalise the relationships between these small-scale suppliers and the main supplier in the form of partnership, a solution that the World Bank Business Partners for Development (http://www.bpd-waterandsanitation.org) has been investigating. In practice, partnerships have shown to offer significant potential, but a whole myriad of problems are still to be resolved if such partnerships are to meet their potential: for example, NGOs and other organisations may simply be unwilling to enter such partnerships with the formality that the private sector may demand, in order to minimise their operational risk.[81] Further, the literature suggests that developing

[79] Evans, 2002.
[(80)] ibid.
[81] BPD, 2002.

manufacturing and service industries to support the water and sanitation sector can also assist in financial sustainability. 82

Participants of the World Bank-UNDP Water and Sanitation Conference agreed that, while for peri-urban areas as many tasks as possible should be delegated to the private sector (and that domestic private investors should be responsible for operation and maintenance in urban contexts), in the rural context public-private partnerships were optimal[83]. In practice, such partnerships may be difficult to establish - rural communities may be satisfied with existing solutions, and may be uninterested to hand over supply to partners who they believe will increase tariffs and cut off those who cannot pay. Other solutions, such as more locally established partnerships may offer an alternative. However, practical issues concerning friction between geographically close communities may cause difficulties if private–public partnerships are established at a local level.[84]

DFID's position on private sector partnerships in WATSAN projects, is that success comes from a balanced partnership between the private sector and the government/client and that the regulatory role is crucial. More specifically, they suggest that stand-post supplies may not be effective under a long-term private sector contract, because it is notoriously difficult to collect water charges from a stand-post, but group connections could be a better alternative option.

C1.4.6 Output based aid

A 2001 World Bank publication on "output based aid" adds to the debate on how to implement cost recovering, financially sustainable WATSAN projects.[85] It argues that traditional approaches to delivering subsidies for public services (in this case WATSAN services) channel the subsidy—whether financed by domestic taxpayers or donors—to the inputs consumed by state-owned service providers, with at best an indirect relationship with the services actually delivered. Affordability concerns are often addressed through cross subsidies built into service prices. The results have often been disappointing. Public sector provision with soft financing frequently suffers from limited incentives for efficiency and innovation, weak accountability for performance, and limited opportunities for leveraging public resources through private sector financing. And cross-subsidies too often benefit the well off more than the poor.

Output-based aid seeks to address these weaknesses by delegating service delivery to a third party (such as a private company or non-governmental

(82) Carter et al, 1999 The Impact and Sustainability of Community Water Supply and Sanitation Programmes in Developing Countries. J. CIWEM 13.
(83) World Bank-UNDP Community Water Supply and Sanitation Conference, 1999.
(84) ERM research as part of preparation for the World Bank publication "Lessons in Private Provision of Rural Infrastructure Services" financed by the World Bank Public-Private Infrastructure Advisory Facility (PPIAF).

(85) Brooke et al, 2001.

organization) under contracts that link the payment public funds to the outputs or results actually delivered to target beneficiaries. This approach is intended to provide a sharper focus on objectives, improve incentives for efficiency and innovation, enhance accountability for the use of public resources, and create opportunities for mobilizing private financing.

It is suggested by the authors that output based aid approaches can provide sharper thinking about the use of the subsidy, perhaps directing the funds to the one-time costs of service connection – typically the main impediment to expanded access to services – rather than the ongoing costs of consumption. This may be particularly pertinent to WATSAN service delivery, cost recovery, and implementation of projects by donor agencies, especially as the authors go on to suggest that depending on the service, small-scale local entrepreneurs could be important suppliers – and so could community groups and NGOs.

C1.4.7 Livelihoods Approach

Two key publications in the UK have a taken a livelihoods approach to wards analysing the design of WATSAN projects and programmes.

Soussan
Looking at a WATSAN project within a livelihoods context [86], Soussan[87] suggests that the aim is to understand:

- the potential hydrological resource base - the quality and quantity of the water resource available;
- the existing and potential patterns of use, including which groups use which particular water resources and the contribution they make to their livelihoods;
- the local social and institutional context of water resource use;
- the legal, political and institutional context for water resource use; and
- the trajectories of change for all of these factors, in order to facilitate the positive changes and mitigate the negative ones.

Within Soussan's "patterns of water use" theme - he suggests that the following issues should be looked at:

([86]) The livelihoods approach typically focuses on the analysis of a set of five interlinked assets, Nicol provides the following description of the asset pentagon: physical capital (household/ individual labour, health), financial capital (access to money), social capital (community mobilisation), natural capital (environmental resource stock), human capital (education and awareness). He also suggests that political capital be included in this analysis of assets.
[87] Soussan, 1998: Water/ Irrigation and Sustainable Rural Livelihoods pp 181-195, in D Carney (ed): Sustainable Rural Livelihoods: What Difference Can we Make? DFID 1998. ISBN 1 861 92 0822.

- *Water and food security*. Is water the only limiting factor to livestock? What about constraints on financial, physical and human capital assets? To what extent are local water markets captured by a local elite, thus constraining rights over, or access to, water for the poorest?

- *Water and household maintenance*. The need to mitigate the morbidity threat of direct water borne and water related diseases, is central to the establishment of sustainable rural livelihoods.

- *Water based livelihoods*. Whose livelihoods (but particularly among the poorest) are based on, or are obstructed by, access to a reliable water supply, and how can these livelihoods best be developed sustainably through the project?

- *Water and ecosystem maintenance*. Water availability is central to both people's livelihoods and to the character and health of the ecosystem where the project is located. How best can the limited water resources available be used and managed, without harming the environment?

Soussan's five themes could be useful in relation to provide a monitoring and evaluation process of the WATSAN project and programme within a context of the livelihood based issues of water use.

Another analytical thread that Soussan identifies is related to the issue of scarcity. He suggests that, although the underlying factor behind water supply projects is often conceived of as trying to reduce the lack of water as a physical entity, scarcity can also be defined socially. There may be social, economic and institutional barriers that limit access to water for different people, and the structure of rights and entitlements both between and (importantly) within communities may be different. Hence, in thinking about reducing scarcity, a livelihoods based WATSAN project must also think about:

- understanding water supply and access conflicts which may be present and the institutional processes through which they can be mitigated;

- the fact that water scarcity (in a social as well as a physical sense) cannot be purely understood at the local scale alone;

- water scarcity, and the related conflict it produces, is dynamic; and

- people are not passive victims of water scarcity, but respond in different ways. These responses can provide indicators on how to develop water based livelihoods or mediate water based conflicts.

Accordingly, a "scarcity" checklist, or set of indicators, to guide the project monitoring process could be developed. It may ask to what extent has the WATSAN project or programme:

- Decreased the time taken to collect water

- Decreased the finance needed to be invested in water
- Decreased the time for water left in storage
- Decreased the capture of water resources by elites
- Increased the diversification of livelihoods (especially among the poorest)
- Decreased the loss or disposal of other assets
- Decreased stress on the four water livelihood uses for water (food, households, livelihoods and ecosystems)
- Helped to manage the exploitation of resources more sustainably?

Nicol

Nicol[88] suggests that, whilst WATSAN projects uniformly provide a productive resource, this resource provides different returns to different capital assets within peoples livelihoods basket due to its multiple uses.

For example, there may be a more tangible return to people's financial assets from using water for livestock (money, savings), then on their physical asset (their health). Choices over water usage may well be a rational reaction to strengthen a weak asset base. Further, a demand focused approach to water supply, taking on board a livelihoods perspective, would therefore design a water project around the interventions which people feel would provide them with the largest (or most immediate) returns, and thus which they'd be most willing to pay for.

Further, Nicol suggests that a demand focused, livelihoods based approach to water supply projects is a natural evolution from the supply oriented and mostly health based view of water projects which has previously prevailed. If the multiple uses of water fed into a range of people's capital assets, then their demand hierarchies for the use of water may change, depending on their circumstance. He suggests that it is necessary to build a livelihoods approach, such that:

"an end goal..(may) not be the achievement of health benefits, but seeks to increase the overall robustness of the household asset bundle, in order to strengthen livelihood strategies (and) assist in creating pro-poor outcomes".

[88] Nicol, 2000.

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Annex D

The Cost Recovery Survey

D1 THE COST RECOVERY SURVEY

D1.1 INTRODUCTION

As part of the research investigation, a cost recovery survey was designed and launched[1]. It was emailed during August- October 2000 to 800 actors in the water and sanitation sector globally, and also disseminated via several WSS e-discussion groups. Water Aid and DFID helped to review the survey instrument.

78 emails failed to deliver, creating a sample size of 722. Over 100 completed surveys and a selection of written notes were received (a return rate of approximately 10%), as well as a number of reports and background papers which people also sent in.

In general, feedback was very positive to the survey, with 56 survey forms completed to an adequate degree allowing for comparative analysis. A database was developed and the survey data inputted and subsequently analysed between September 2000 - March 2001. An undergraduate dissertation for the Scottish Agricultural College was produced from the results.

At its core, the survey attempted to identify:

- What did WATSAN organisations understand by the terms 'cost recovery' and 'demand assessment'?
- What are WATSAN organisations doing about cost recovery in rural and peri-urban areas?
- In the experience of respondents, what approaches to cost recovery on WATSAN projects seem to work?

D1.2 WHO WAS SURVEYED?

The survey grouped those organisations, undertaking WATSAN projects in developing countries, into five main types:

- Private sector companies/consultancies;
- Non-Governmental Organisations (NGOs);
- Development agencies;
- Development Banks/ IFIs; and
- Research/ academic bodies.

[1] *A copy of the survey is presented at the end of this Annex.*

The survey was global in its coverage, with forms being emailed to organisations in South America, Africa, and Asia, as well as to organisations with multi-regional responsibilities.

However, the survey was *not* sent to any representatives of National Government or Parastatal Agencies with interests in water and sanitation service delivery. Hence, the survey did not seek to gauge how these Agencies could become more engaged in cost recovery issues. The aim of limiting the survey to NGOs, Development Agencies and Banks, the Research Community and the Private Sector, was to focus on ascertaining the level of agreement or difference within the "policy influencing international community" about issues of cost recovery. In hindsight, this could be a potential weakness. It may have been advantageous to also include National Government Agencies in developing countries in the survey process to represent their views. Nevertheless, it is hoped that the case study reviews of India and South Africa pick out the Government Policy and Agency approach to cost recovery issues.

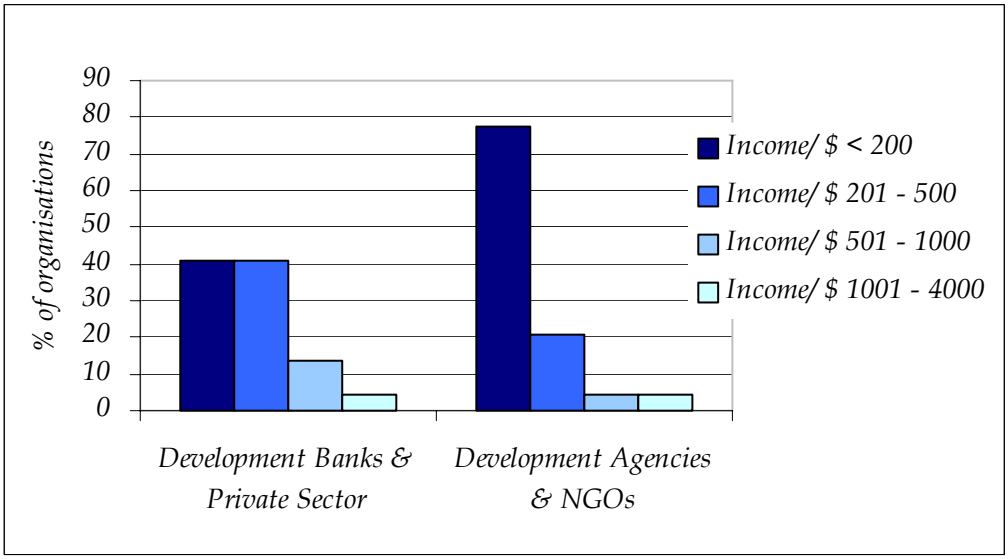
Out of a reasonably balanced survey sample between all five groups of organisation, 31% of replies came from the private sector; 25% from NGOs; 21% from development agencies; 11%from Development Banks/ IFIs; and 7% from research/ academic bodies. This may indicate the higher level of interest the private sector has in engaging on this issue.

These organisations all have differing attitudes to cost recovery in WATSAN projects. In general, NGOs are the least concerned with cost recovery, while private sector companies tend to treat it as a matter of priority.

D1.3 WHERE ARE WATSAN PROJECTS BEING IMPLEMENTED?

Over a third of the WATSAN projects surveyed are being carried out in Southern and Eastern Africa. However, many WATSAN projects are also being carried out in South East Asia, North Africa and the Middle East. The majority of these projects are directed at 'low-income' households (between $0-500/ year) in rural and peri-urban areas. The Development Agencies and NGOs who replied serve more households at the bottom of this range (less than $200/year) when compared with replies from Development Banks and the Private Sector *(Figure 1.1)*.

Figure 1.1 ***Income groups that organisations mostly serve through their WATSAN projects (based on annual household income)***



D1.4 *SCOPE OF PROJECTS*

The scope of WATSAN projects varies for each type of organisation (*Figure 1.2*). However, most organisations dedicate part of their programme portfolio to WATSAN projects (more than for water or sanitation only projects). Interestingly, those Development Agencies who replied undertake slightly more of their WATSAN projects as part of wider rural development than other organisations (*Figure 1.3*).

Figure 1.2 ***Scope of WATSAN projects carried out by different organisations***

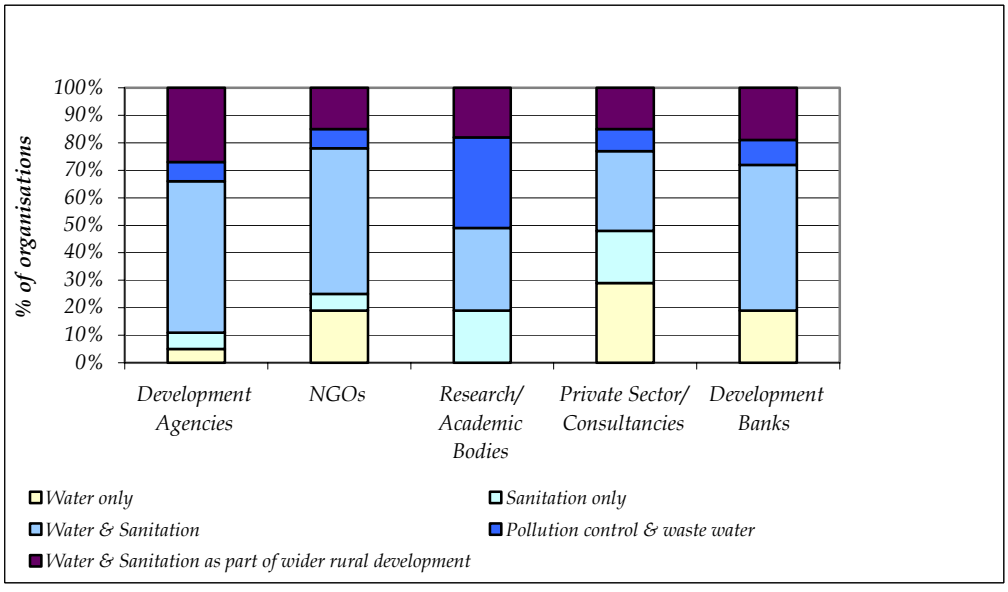
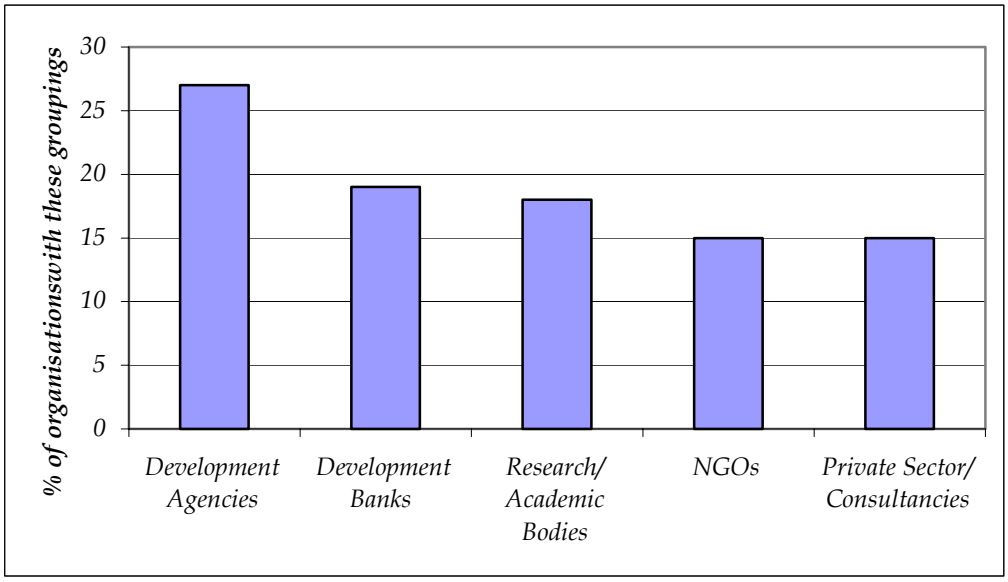


Figure 1.3 ***Organisations carrying out WATSAN projects as part of wider rural development.***



D1.5 UNDERSTANDING OF COST RECOVERY

D1.5.1 Meaning

Cost recovery seems to mean different things to different organisations. For example, the following statements were made in the survey:

"Cost recovery is the attempt to recover project-level operation and maintenance costs" (a Development Agency)

"Cost recovery is the full/partial payment of capital and running costs" (Private Sector)

"Cost recovery involves a capital contribution (c 20%), full operation and maintenance costs, and increasing ability to finance extensions to the scheme" (NGO).

There was no overall consensus on what cost recovery in a WATSAN project or programme means amongst the respondents.

D1.5.2 Recurrent Costs

Most organisations that replied feel that it is necessary to recover at least some of the implementation costs from the community being served. The preferred types of costs to be recovered were:

- Operation and management costs only; and
- Operation, management costs and replacement costs.

In relation to our definition of financial costs for WATSAN services, based on OFWAT and outlined in *Section 2* of the main report; it seems that most organisations aimed to cover costs of some to all of the costs of operations and the costs of capital maintenance.

Figure 1.4 illustrates the range of cost recovery options considered sufficient to achieve financial sustainability in WATSAN projects, based upon those organisations that replied. *(*The subdivisions of costs represent an attempt to gradate the three main groups of cost slowly upward).

Figure 1.5 compares which organisations consider WATSAN projects to be financially sustainable if they recover either (1) costs of operations and costs of capital maintenance or (2) these costs plus the costs of servicing capital

The difference in outlook on this issue between the NGOs and Development Agencies, and the Private Sector and Development Banks/ IFIs that replied is noticeable. A larger number of private sector organisations and Development Banks consider that full recovery of costs is required for a project to be financially sustainable.

"Cost recovery is ensuring project sustainability by guaranteeing that users of the project are taking on the cost of sustainability through efficient financial responsibility." (Development Bank)

Some Development Agencies and NGOs have begun to think along similar lines.

"Cost recovery is ensuring there is a system in place for the collection of funds so that communities can maintain the project." (NGO)

Figure 1.4 ***Levels of cost recovery considered sufficient to achieve financial sustainability of WATSAN projects***

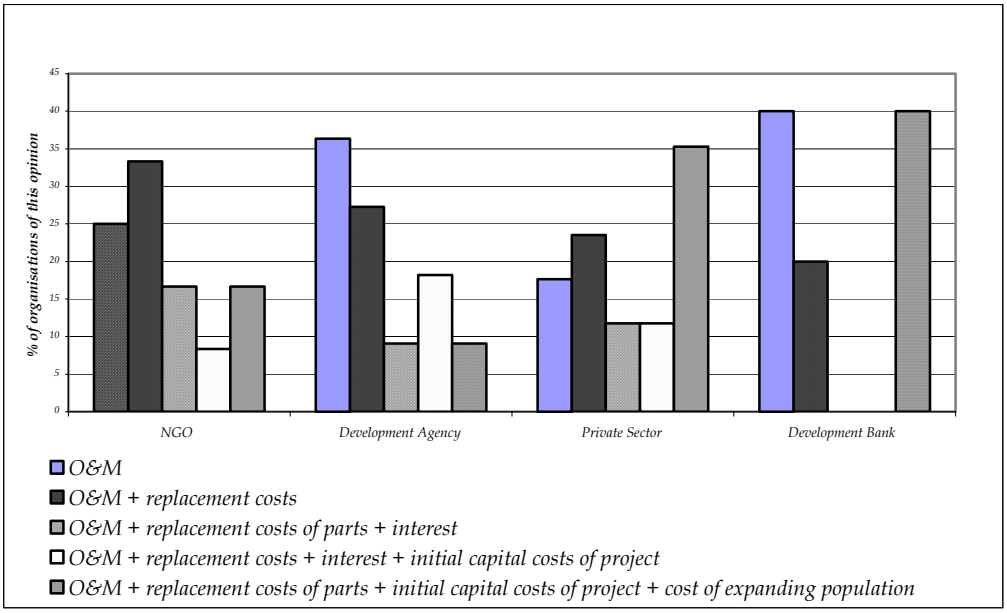
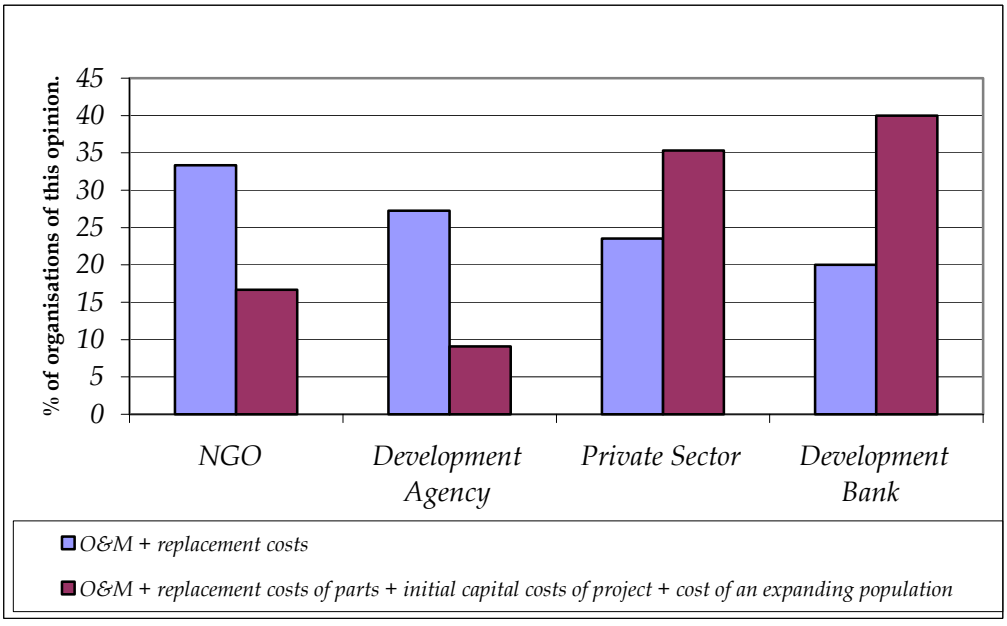


Figure 1.5 ***Levels of cost recovery considered sufficient to achieve financial sustainability of WATSAN projects.***



These differences between the private and public sector approaches to cost recovery may differ for the following reasons.

For the public sector (NGO/ development agency), the financial remit for a WATSAN project is to:

- Meet basic needs as stipulated in government policies;
- Make an equitable use of subsidies; and

- Reach break-even, i.e., revenue generated equals the cost of supply.

For private companies, their remit is to:
- Generate a profit or surplus; and
- Ensure a return on fixed assets.

D1.6 COMPLICATIONS TO COST RECOVERY

Although many organisations that replied have the intention to make a WATSAN project financially sustainable through adequate cost recovery, there are often factors that complicate this process. The most prevalent of these tend to be political factors, such as inappropriate public policy or a lack of political willingness to institute cost recovery mechanisms. The institutional establishments and framework are also critical.

"The projects undertaken by my organisation are affordable, with appropriate technologies, but government schemes still tend to use expensive high technologies".

According to the organisations that replied, a range of additional factors can also complicate the cost recovery process, such as [(1)] :

- Low and/ or variable incomes;
- Affordability and appropriateness;

"*Ability to pay is critical, but providing affordable services to meet peoples' needs is even more important."*

- Insufficient willingness to pay;

"An appropriate level of service must be provided according to the demands of the community. Willingness and ability to pay will play a role in this."

- Distrust of the cost collection system; and
- Lack of management transparency.

"*Transparency and accountability for operators' (and governments') actions are critical for cost recovery, especially for the population involved."*

Historical practices were also said to play a role in the degree of cost recovery. For example if other agencies have provided the service free of charge, a history of non-payment and a subsequent lack of willingness to pay may result.

Other less significant issues included:

- Expense of the service and project;

- Land tenure issues; and
- Culture and religion.

For both water and sanitation projects, the flux of the population size is considered the least important factor resulting in complications for cost recovery.

Table 1.1 summarises the issues seen as complications to cost recovery.

Table1.1 ***Complications to Cost Recovery in WATSAN Projects (ranked iIn order of the issues most often stated by organisations working on WATSAN projects)***

	Water		Sanitation
1	Political Interference	1	Political Interference
2	Low/ Variable Incomes	2	Insufficient Willingness to Pay
3	Distrust of Cost Collection System	3	Low/ Variable Incomes
4	Insufficient Willingness to Pay	4	Lack of Management Transparency
5	Lack of Management Transparency	5	Distrust of Cost Collection Systems
6	Inappropriate Project Design	6	Failure of Other Agencies to Cost Recover
7	Failure of Other Agencies to Recover Cost	7	Inappropriate Project Design
8	Expense of Project	8	Cultural/ Religious Reasons
9	Social Exclusion Issues	9	Social Exclusion Issues
10	Land Tenure Issues	10	Land Tenure Issues
11	Cultural/ Religious Issues	11	Expense of Project
12	Flux of Population Size	12	Flux of Population Size

It is interesting to note that political interference ranked top of the replies in both water and in sanitation, above low income or unwillingness to pay. Furthermore, this is exactly the same finding about obstacles to cost recovery as identified by another study - the Business Partners For Development review of cost recovery in water.[2]

D1.7 *MEASURING AFFORDABILITY*

The 3-5% rule has often been used as a measure of affordability for WATSAN services. It has been considered a simple yet relatively accurate measure of affordability that can assist decision-making. The survey revealed 28% of those who responded still use the 3-5% rule, stating that as an initial tool it can be useful.

"The 3-5% rule provides an indication of whether a technical plan is financially feasible in terms of ongoing operation and maintenance costs, but it is only an indication and should not be considered as a final calculation."
(Private sector/consultancy)

(1) This list is by no means complete. Many other factors were also mentioned: inappropriate project design, bad examples created when other agencies fail to recover costs, social exclusion issues, land tenure issues and project expense

(2) Komives, K. and Stalker-Prokopy, L. (2000) Cost Recovery in the Focus Projects: Results, Attitudes, Lessons and Strategies. Business Partners for Development Research and Surveys Series.

However, there was also a realisation from other respondents that this rule is too simplistic and the issue is far too complex to simply provide a blanket rule for all situations.

"It is not really possible to define a unique ratio for such a complex issue. Every local situation should have its own appraisal of what is possible."
(Private Sector/Consultancy)

Other methods for measuring affordability suggested in the survey responses included:

- PRA techniques including wealth ranking and community self-assessments of individual's ability to pay;
- WTP surveys (Contingent Valuation questionnaires);
- Community financial surveys;
- Use of past experience in other villages;
- Cost of current coping strategies; and
- Use of wealth indicators such as transport and purchasing habits.

In trying to find the most suitable way to measure affordability, some of the organisations that replied have found interesting and somewhat unique approaches. For example, a private sector organisation in South Africa used the amount of consumption of beer as an indicator of actual (effective) affordability for a WATSAN service.

D1.8 DEMAND ASSESSMENT

In the move away from using the 3-5% rule, most respondents saw demand assessment techniques, of one form or another, as a useful tool in helping to achieve financial sustainability in a WATSAN project.

"Demand assessment improves the chances of the project being financially sustainable as compared to a supply driven approach." (NGO)

D1.8.1 Meaning

There was a range of different ideas as to what demand assessment actually was, but most focused around matching a level of service provision to a willingness to pay for it:

"Demand responsive approaches need to reflect the present need and interest and affordability of consumers or communities. Demand is dependent on health, social and environmental values." (NGO)

"Demand assessment involves assessing peoples needs and wants and comparing these with the willingness to pay and ability to pay for the expected services."
(Private sector/consultancy)

"Demand assessment is a feasibility study assessing demand for water service improvement and willingness to participate, involving time and money." (Development bank)

1.8.2 Experience

While a number of the survey respondents explicitly stated that it is essential to assess demand prior to the start of a project, 73% of the respondents stated that they determine people's preferences for different levels of service at some stage during the project.

The survey found that, from respondents' experiences of demand assessments, the three most important factors for project viability and financial sustainability were:

- The interest and demand from the consumers;
- The consumer's needs; and
- The affordability of the service.

However, many other factors to take into account were considered important, such as:

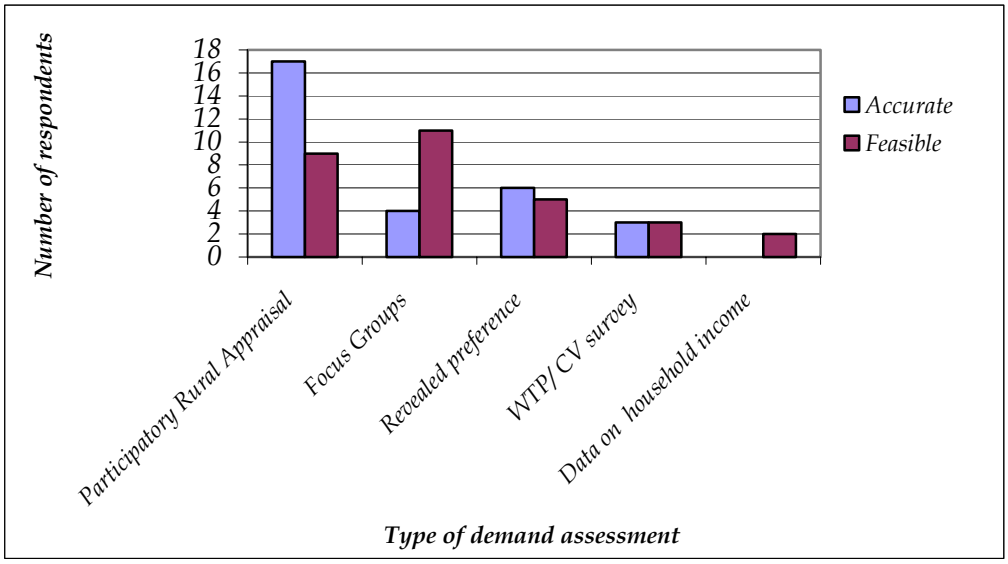
- Community interest in levels of service;
- Willingness to Pay;
- Demand creation;
- Willingness to Participate; and
- Evaluation of present and projected community characteristics.

It is interesting to note that above willingness to pay and affordability stands the need to find an interest and the (notional) demand from the consumer for the service.

1.8.3 Approaches

There are many types of demand assessment techniques used in practice, however the most frequently used by respondents are Participatory Rural Appraisal (PRA) and focus groups. Figure 1.6 show the preferred demand assessment techniques, in terms of accuracy and feasibility.

Figure 1.6 ***Most preferred demand assessment techniques in terms of accuracy and feasibility***

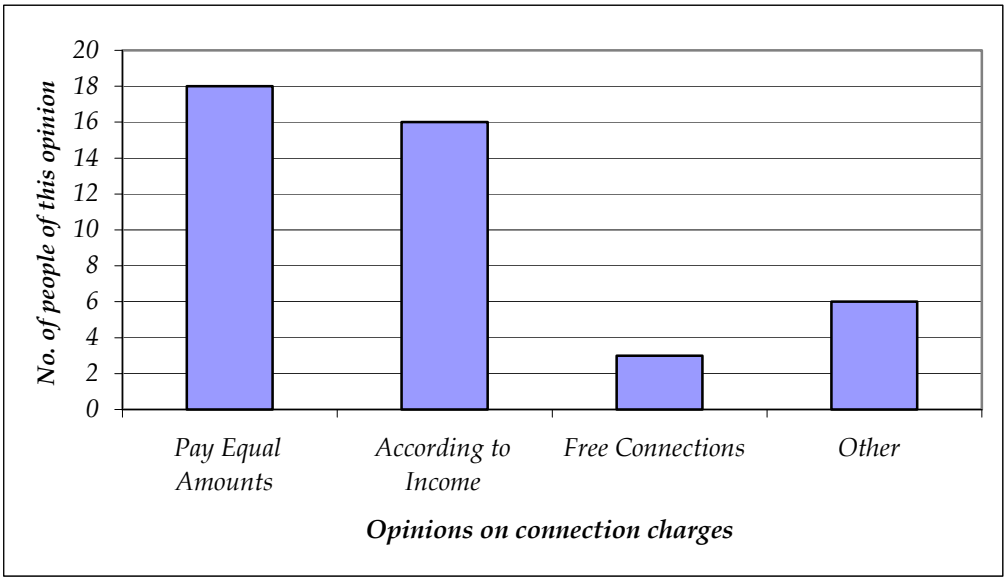


It seems that resource or technical intensive studies such as Contingent Valuation are used less often, and focus groups, though less accurate are more widely used. Responses to PRA were interesting. Though it is considered accurate by many respondents, its feasibility, though still strong, is less than that of focus groups. Again, perhaps time and resource constraints are an issue here.

D1.9 *CHARGING FOR WATSAN SERVICES*

When asked about charging for WATSAN, the respondents were asked to consider the level of connection charges, and the structure of tariffs. The survey revealed that free connection to water services were not considered to be the best form of water and sanitation provision. In fact, 42% of respondents felt that users should pay equal amounts for their water connections, while 37% considered a connection charge, which reflected the user's level of income was more appropriate as shown in Figure 1.7.

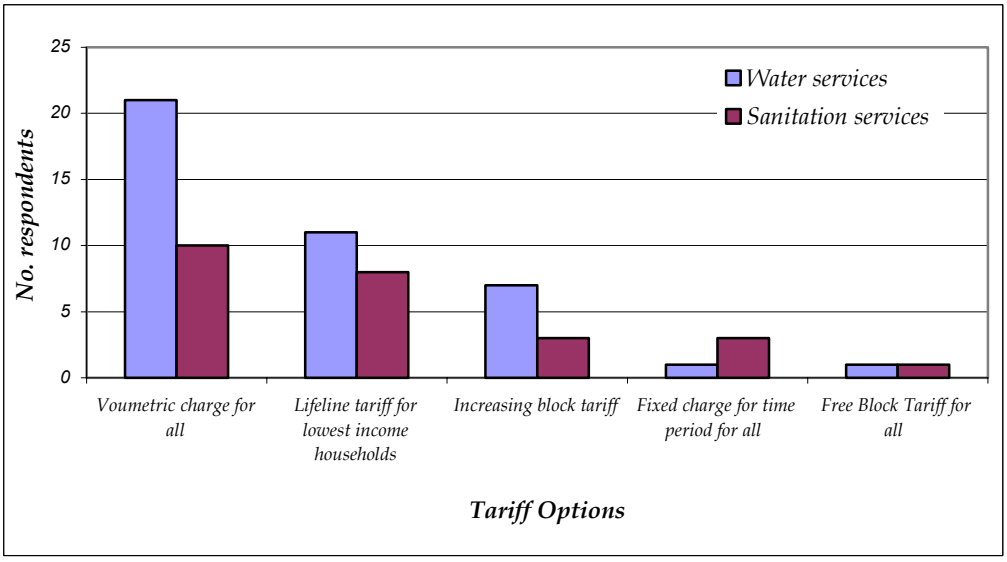
Figure 1.7 Summary of the opinions on structure of connection charges



For both water and sanitation provision, once the connection charge is established, the majority of organisations who replied believed that users should be charged in relation to the volume of water that they use. Lifeline tariffs for the lowest income households and increasing block tariffs were considered to be useful charging structures. Free blocks were the least popular option (Figure 1.8).

The development agencies, private sector companies and NGOs who responded felt that these tariffs should reflect *some* of the financial costs of supply. The development banks tended to feel that prices should reflect the long run marginal costs of supply.

Figure 1.8 Most desirable tariff structure for WATSAN services



1.10 WHAT WORKS?

Within rural water and sanitation projects, a number of factors were considered relevant attributes of a successful project. These are listed in Table 1.2 ranked in order of descending importance. It shows that reliability of service and distance to household were considered the two most important features of water projects whereas convenience and cleanliness were ranked highest for sanitation projects.

Table 1.2 Attributes of successful rural water and sanitation projects

Rank	Water projects	Sanitation projects
1	Reliability of supply	Convenience
2	Distance to household	Cleanliness
3	Price charged	Ability to upgrade
4	Community managed	Administering agency
5	Quality	
6	Operation, maintenance and charging	
7	Administering agency	

The factors in Table 1.2 are mainly associated with aspects of the supply. Concerning the *process,* a number of organisations stress the importance of public involvement. For example, an NGO in India considered the payment collection mechanism to be a success due to the *people-based system of fund collection, management, utilisation and maintenance.* Along the same lines a private sector company in South Africa stated that success was due to *transparency and a high level of public awareness and availability of relevant information.*

Others mentioned the financial arrangements for the projects, and one interesting response, by a private sector company, was that *availability of flexible payment systems,* helped to ensure a successful project due to successful payment collection.

Annex E

Meta Analysis of Water and Sanitation Willingness to Pay Studies

E1 META ANALYSIS OF WATER AND SANITATION WILLINGNESS TO PAY STUDIES

E1.1 INTRODUCTION

This annex presents a meta-analytical review of the willingness to pay evidence drawn from a collection of 25 published contingent valuation studies. The aim of the review is to pool together and analyze data from a range of contingent valuation surveys to see what in general affects people's willingness to pay for WATSAN services.

Contingent valuation studies for WATSAN are usually interested in measuring the willingness to pay (WTP) of recipients for a new or improved WATSAN service. These studies tend to build on the observation that, when faced with poor access to WATSAN services, households are often prepared to make significant economic sacrifices in pursuit of alternative, better services. Contingent valuation studies typically investigate ex ante (before project) preferences using hypothetical questions about the level of service the project may provide.

An endnote to this annex discusses contingent valuation in more depth.

Many of these studies suggest that people *are* WTP for a given level and type of improved water service; and are often WTP enough to support service levels above the minimum prescribed (World Bank Water Demand Research Team, 1993; Singh *et al*, 1993; Garn, 1998; Rall, 1998; Webster, 1998; Mvula, 1999a). Many surveys have also revealed that while income is indeed a significant factor in determining households' demand for water services, it is not the sole determinant of demand. Rather, WTP should be seen as a function of several variables that reflect the socio-economic, demographic and physical environmental characteristics of households that may vary according to season and location. (Whittington *et al*, 1990b; Altaf *et al*, 1992; Altaf *et al*, 1993; Bohm *et al*, 1993; Brookshire and Whittington, 1993; Fass. 1993; Howe and Dixon, 1993; McPhail, 1993a, b; 1994; Singh *et al,* 1993; Griffin *et al*, 1993; World Bank Water Demand Research Team, 1993; Briscoe *et al*, 1995; Nyong and Kanaroglou, 1999).

Rarely, however, have the data from a range of these WTP studies been pooled together to undertake a systematic comparison of their findings, to look for commonalities or general patterns, or indeed to model their data for significant statistical relationships between WTP and similar household characteristics. Undertaking what is known as a "meta-analysis" could help pick out some of the recurring patterns and strongest linkages prevalent in many of these studies, thus supporting or developing further discussions on demand, cost recovery and WTP.[1]

[1] An important conceptual point in the meta-analysis is to be aware of what the pooled WTP bids actually represent. This is partly complicated by the inconsistent definition of the WATSAN improvement across the different studies. Some studies imply that the quantity is a binary connection decision (do you want more/ better quality water at this price – yes or no)

E1.2 META ANALYSIS

E1.2.1 Background

A meta-analysis is a statistical review of existing studies that permits the systematic investigation of the magnitude and direction of any number of relevant explanatory variables on a dependent variable. The practice derives originally from clinical research and the need to derive a robust central or mean experimental result from a body of literature that is essentially reporting similar experiments or trials of the affect of one (or more) variable(s) on a single dependent or response variable. A way of doing this is to extract trial results from each study and to compile an overall data set for the derivation of the central result.

Meta-analysis has recently crossed over into environmental economics[2]. A need to derive some consensus on valuation issues derived from the growing body of environmental contingent valuation studies has emerged in the discipline over the past few years. This has given rise to a standard meta-analytical approach for explaining environmental economic WTP data.

Using a similar methodology, it is possible to analyse the WTP data for water as a function of selected variables across a range of range of WTP studies. The method also allows the analyst to isolate exogenous elements such as study design or other unique elements. In essence, the aim is to isolate the key variables, which contingent valuation studies have shown to be relevant in a demand responsive approach. In driving household preferences, these are the key elements that have to be considered in a cost recovery strategy.

1.2.2 Methodology

The principal result of a single contingent valuation study is a mean (average) or median[3] community WTP that can be used in a cost-benefit analysis of the WATSAN programme and/or to guide tariff design. A typical study may elicit WTP responses from hundreds of individual households and these data will be analyzed to derive both this mean/median, and a statistical function to explain and validate the responses received.

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while other studies are more specific about volumetric allowances. This distinction about the "good" in question also includes how payment is to be made. In short WTP relates to varying quantity variables and we have to be cautious in our interpretation of the results. Strictly speaking it is safer to interpret our analysis as attempting to derive an *income elasticity of WTP* for an improvement in WATSAN services, of some description. This is distinct from a specific income/ price - quantity relationship that is normally associated with elasticity calculations. In the latter case, the location on the demand curve (i.e. the initial quantity endowment) influences the elasticity calculation. In our case, we are forced to make a crude distinctions about the start and end points of quantity (worse and better) and we can test how WTP changes by using dummy explanatory variables. We are simply clarifying what the data seems to say about the percentage change in WTP for a largely unspecified improvement in WATSAN services as income rises. This is a theoretically different relationship, but one that is no less useful.

[2] See for example Shrestha, R. and Loomis, J. (2001), Testing a meta analysis model of benefit transfer in international outdoor recreation, Ecological Economics 39, pp 67-83.

[3] Both are measures of central tendency, but the median is the amount of money that just over 50% of a sample population would be WTP.

Thus in notational form, in each individual study a questionnaire collects data on WTP in response to proposed service change (∆Q) and typically data on income (Y) prices of other goods (P) and other socio economic characteristics (SE). Next a final statistical relationship is derived to show and verify how the WTP statements will be a function of the proposed change in Q - the suggested improvement in WATSAN services, and of all the other factors which influence the household's valuation of a change in Q including Y, the price of other goods P and a range of other socioeconomic characteristics of the household.

For the individual study this function will typically be of the form:

(1) $WTP = f(b\,\Delta Q,\ \delta\,Y,\ a\,P,\ e SE) + \text{statistical error}$

What is estimated in these statistical analyses is the relationship between the variables themselves as described by the coefficients (b, δ, a, e). These coefficients explain the causality and magnitude of the influence of these other variables on WTP. Effectively they tell the story of how the data explains the WTP responses.

To proceed from a single study result to a meta analysis, the estimated mean (or median) WTP for each study is taken; and the coefficients from the specific study bid functions are used to compile a new data set that can estimate mean or meta coefficients. The idea is that this re-analysis of the aggregate data set creates a mean function that can be used in a generic predictive way to make general inferences about the relationship between WTP and key variables.

For example, to assume a meta-function of the generic form of equation (1) above, and to use it to predict the level of WTP for a WATSAN programme in a particular country, the estimated mean coefficients would be taken and the mean variable values for the variables ∆Q, Y, P, and SE would be plugged in. These data will generally be observable for the site of interest.

1.2.3 Data

Data compilation in socio-economic meta-analysis always involves a degree of subjective interpretation of source studies. This is because (unlike clinical trials) there is considerable variability in individual estimation methods that must be standardised.

In this case, the sample was derived from a search of the published and unpublished literature on water demand. The sample contained predominantly published studies or those deemed to be of publishable standard. The latter was judged by the extent to which a study observed the received norms of valuation best practice for revealed or stated preference methods.

Following a search for suitable samples, the final meta-dataset comprised 25 studies yielding a total of 91 (mean WTP) observations and corresponding to an average of 3.6 observations per study. The studies included in the

analysis and the corresponding number of observations taken from each study is presented in *Table 1* (at the end of this annex). More than half of the studies provided more than two observations with two studies providing twelve observations (*Table 2*).

One of these two studies provided one observation from each of twelve villages within the study site (Boadu, 1992) while the other assessed the WTP bids of households in three villages and asked respondents in each of these villages to value a particular level of service (private or communal) depending on the service that each household already had in place (Altaf *et al*, 1992; 1993).

The average sample size was 180, with the smallest sample comprising 13 households and the largest, 968.

As *Table 3* shows, ninety percent of the studies included in the meta-dataset were CVM studies and nearly three quarters of all the WTP bids were obtained through some form of bidding game[4]. Only one quarter of the studies were undertaken after the publication of the NOAA guidelines in 1993 (an influential publication effectively setting out "best practice" for CVM studies). Over half of the set of studies report to have been influenced by one author (Whittington), with seven out of the twenty five studies included in the meta-dataset conducted with Whittington as part of the research team. Only two observations (from one study) allowed respondents time to reflect on their responses.

Table 4 presents a basic summary of the valuation outcomes by the various study characteristics including estimated medians. It is difficult to say how the calculated median WTP figures for the different dates, authors and conduct methods for each study differ from *a priori* expectations, as the direction of magnitude of the effect is ambiguous. Median WTP seemed to be higher for those studies conducted after 1993, as well as for those where Whittington was or may have been a major influence. It was also higher for studies using stated preference approaches than for those using revealed preferences (possibly confirming the expectation that respondents feel under more pressure in the presence of the interviewer and will try and comply with what they perceive to be the interviewer's expectations). Stated WTP was marginally lower for open-ended than for closed-ended, but again, the elicitation procedure has an ambiguous effect on WTP. Respondents who were given time to think about their responses bid less, on average, than those who were not although the sample size for those given time to reflect was small so the results are not necessarily statistically valid.

From the valuation studies, *Table 5* was drawn up to identify the variables that partly explain WTP. The table details the direction of assumed causality.

[4] It is assumed that bidding procedures can only be performed when CVM is used.

Statistically, the differences found in average WTP in each category can be confirmed by the outcome of the non-parametric Kruskal-Wallis test statistic. In this test, H refers to the test-statistic for the Kruskal-Wallis test, which has, under the null hypothesis, approximately a chi-square distribution. *p* is the two-tailed probability of the Type I error (that is, that the null hypothesis will be rejected when it is in fact true).

The results presented in *Tables 3 and 4* indicate that there is a significant difference at the conventional significance levels between recorded WTP amounts among studies conducted by different groups of people and using different methods of researching WTP. The elicitation format and date of study do not however appear to result in statistically significant differences in recorded WTP amounts.

1.3 HOW KEY VARIABLES IN THE STUDIES RELATE TO WTP

1.3.1 Study Site Characteristics

Wealth of the country

One-third of the studies (29 observations) were conducted in middle-income countries, with the remaining studies being undertaken in low-income countries.[5] Of the studies conducted in middle-income countries, only two (those from Brazil and South Africa) were from upper middle-income regions (*Table 6*).

As would be expected, the median WTP was higher among middle-income countries than among lower-income countries and was more than five times higher among urban respondents than among their rural counterparts (*Table 7)*.

It is interesting to note from *Tables 6* and *7* that the two upper-middle income countries are also those with the most unequal distribution of income, as measured by the Gini coefficient.[6]

At a national level, the distribution of income among the group of developing countries may also be uneven. The distribution of per household Gross National Product (GNP) per month of the thirteen countries represented in the studies included in the meta-dataset is depicted by the histogram in *Figure 1*.

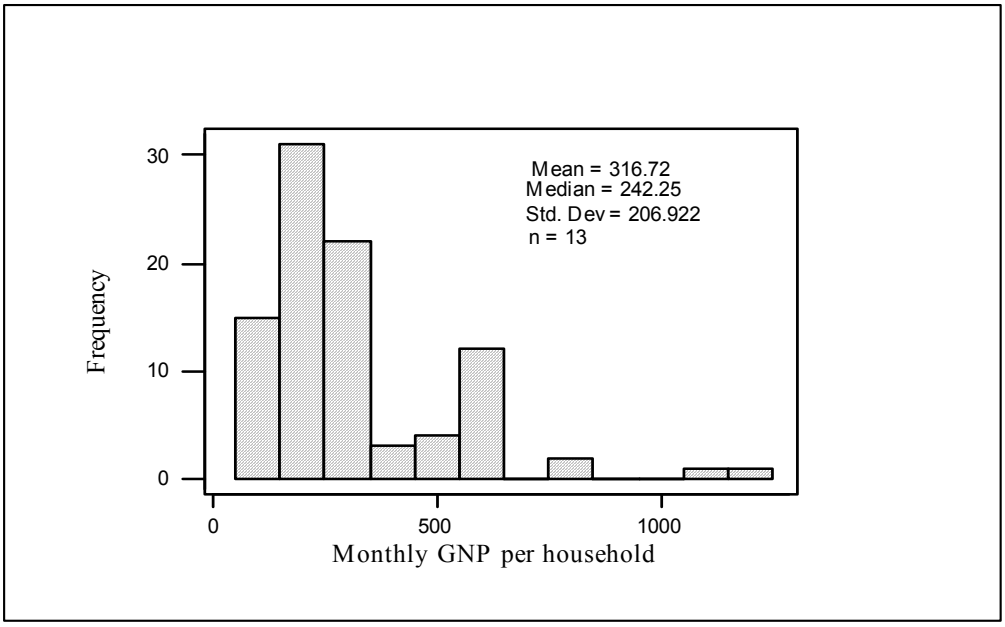
[5] Classifications used here are based on the World Bank World Development Report of 1995.

[6] The Gini Index is a measure of the extent to which the distribution of income among individuals and households within an economy deviates from a perfectly equal distribution, where an index of 100 represents perfect equality (Todaro, 1994). An examination of the Gini co-efficients and percentile income shares for the other countries included in the study (World Bank, 2000) reveals that the distribution of wealth is highly skewed to a minority population of very high-income earners and it appears that high income inequality is a feature of developing countries (the Gini Index for industrialised nations seldom reaches above 40 - Sweden has an index of 25, the United States, 40 and the United Kingdom, 36.1) (World Bank, 2000).

The distribution is clearly skewed to the right indicating that even across households in the relatively limited range of developing countries included in these studies, aggregate income levels are widely dispersed. Mean GNP per household per month is US$316.72 (constant 1995 prices) but the median is only US$242.25.

Thus, if WATSAN planning is to be based on aggregate income data, then it is important that a measure of spread is included in the analysis of the national data so that a better idea of the shape of the distribution can be obtained.

Figure 1 ***Histogram showing the distribution of GNP per household per year (in US$ 1995) across the 14 countries represented in the studies included in the meta-dataset***

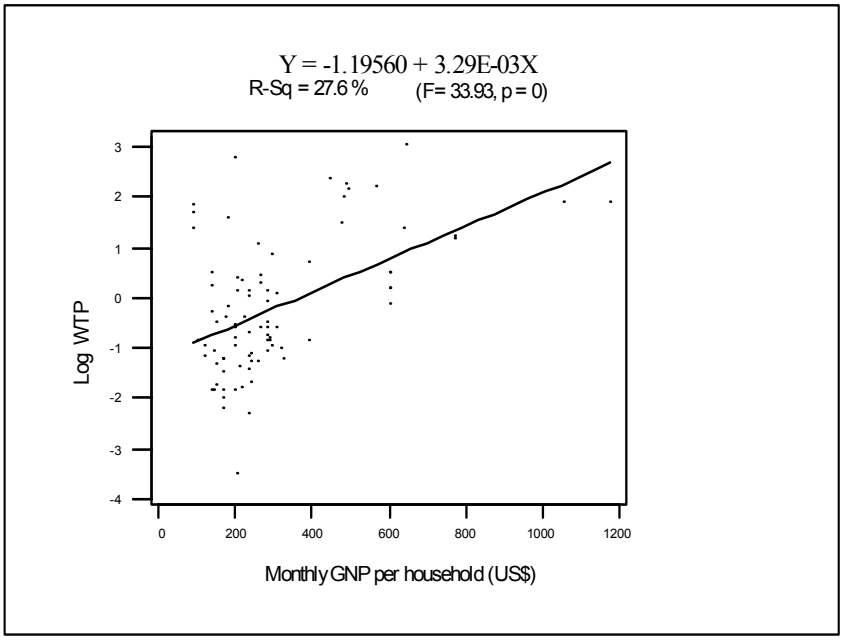


A simple plot of log WTP for water services against GNP per household per month further illustrates this finding[7] (*Figure 2*). Most of the observations display relatively low levels of GNP but there is wide variability about the best fit. The interpretation of the regression equation is that a ten-dollar increase in monthly GNP per household will raise the WTP bid by 0.032 percent[8]. Thus, a household currently paying US$1 per cubic metre of water would be willing to pay 32c more if monthly GNP was raised to US$100 per household. From the plot, one can also see that at low incomes some households appear to be prepared to pay relatively high amounts for improved water.

[7] The model R-squared is only 29%, but this is not uncommon for meta data that is cross sectional in nature.

[8] Note that GNP has not been logged therefore the interpretation is one of a semi-log relationship (see Santos, 1999).

Figure 2 Simple regression plot of Log WTP against monthly GNP per household



Location

Almost one third of the studies were conducted in sites located in arid regions[9] and only twenty per cent of the observations assessed the demand for water of households living in urban areas. The difference between the average WTP amounts across different features of the study site is statistically significant for all the tested features of the study site at a 1% level (*Table 8*).

These preliminary observations demonstrate the need for more localised investigations of what people can actually afford to pay for their water services and what determines their willingness to pay. Simple descriptive statistics based on *ceteris paribus* conditions do not, however, provide sufficient evidence to either confirm or disprove the affordability rule-of-thumb as the important interaction components between income levels and other important determinants of WTP have not been considered. As mentioned earlier, the distribution of WTP bids are a function of several *actual* determinants, related to the features of the household under study and that particular household's preferences for different levels of service, as well as a function of a number of systematic and random error elements (related to the study design and conduct characteristics, the study site and any mistakes that may have entered the dataset in the interpretation and recording of responses or in the calculation of mean figures). All the systemic components should be accounted for before conclusive findings can be made.

[9] Regions where rainfall is below 500 mm per year (*Times*, 1997).

E1.3.2 Household Characteristics

Income

Figure 3 shows the distribution of income across the studies and its high variability. The range of monthly household incomes across the studies ranges from US$8.17 per month (constant 1995 prices) to US$212.86, with a standard deviation of US$60.13. Reported monthly household incomes of household samples within studies are also wide-ranging. In India, for example, household income varied from US$10.36 in Kerala district to US$212.86 in Punjab and both of the studies were conducted in rural areas[10].

Figure 4 shows that the distribution of WTP across the studies and how highly it is skewed towards a low WTP– most households are willing to pay small only amounts per month for improvements in their water supplies.

The mean monthly WTP for water services across the studies is US$2.1, with some samples willing to contribute as little as US$0.03 per month towards the proposed service and others as much as US$21.62 per month, more than twice the mean income levels of some samples. From an analytical viewpoint, variation in WTP estimates is desirable if it can be associated with variation in some independent variables. However, as mentioned earlier, this large variation could be an indicator of unrealistic descriptions of project benefits. For example, the WTP amount for the households in Ecuador was over US$21 per month and suggests that the estimate of the benefits of water to households in this rural community has been highly overstated, especially since it is mentioned (Hardner, 1996) that the community supports a non-cash based economy.

The wide range of inter- and intra-study sample sizes is likely to have caused clustering and has probably generated a significant amount of the apparent variability in the WTP bids (Deaton, 1997). In surveys of rural areas where the clusters are often villages (so that households in a single cluster live near one another and are interviewed for the same study), data may be produced where observations from the same cluster are more like one another than are observations from different clusters. This may be as a result of 'neighbourhood effects' (Deaton, 1997) where those who live near one another and thus become more or less uniform within a village copy the local eccentricities. Sample villages are often widely spatially separated, their inhabitants may belong to different castes or tribes and they may have distinct occupational structures[11].

[10] It is possible that some of this divergence arises as a result of measurement error. Some of the studies reported income levels based on proxy indicators such as the number of visible assets (such as radios, refrigerators and television) observed in the homestead. In rural areas, wealth is not necessarily measured in this way especially where the infrastructure necessary to operate consumer durables is not accessible. Households may also have given incorrect estimates of their income levels where these fluctuate with seasons (being highest immediately after the harvest season *ceteris paribus*).

[11] The main problem with clustering is that the sample variance is inflated above what it would have been in the independent case but where multiple observations are obtained from the same environment, random effects can sometimes be controlled for in ways that would otherwise not be possible (Deaton, 1997). The cluster design of the data should not be ignored as the standard formulae for variances of estimated means will be too small. This is as much an efficiency issue as an accuracy issue. Since the error terms in the in regressions are correlated across observations, OLS regression is not efficient within the class of linear estimators and some other linear estimator may be more appropriate (Deaton, 1997, p74).

Mean WTP as a percentage of mean monthly household income is around 4%, which would appear to substantiate the five-percent affordability rule. However, when one examines the shape of the distribution of reported sample income (*Figure 3*) and compares it to the distribution of stated WTP (*Figure 4*), it is once again shown that this rule-of-thumb may not be generally applicable as the shape of WTP does not closely mirror that of income.

Figure 3 *Histogram showing the distribution of mean monthly household income*

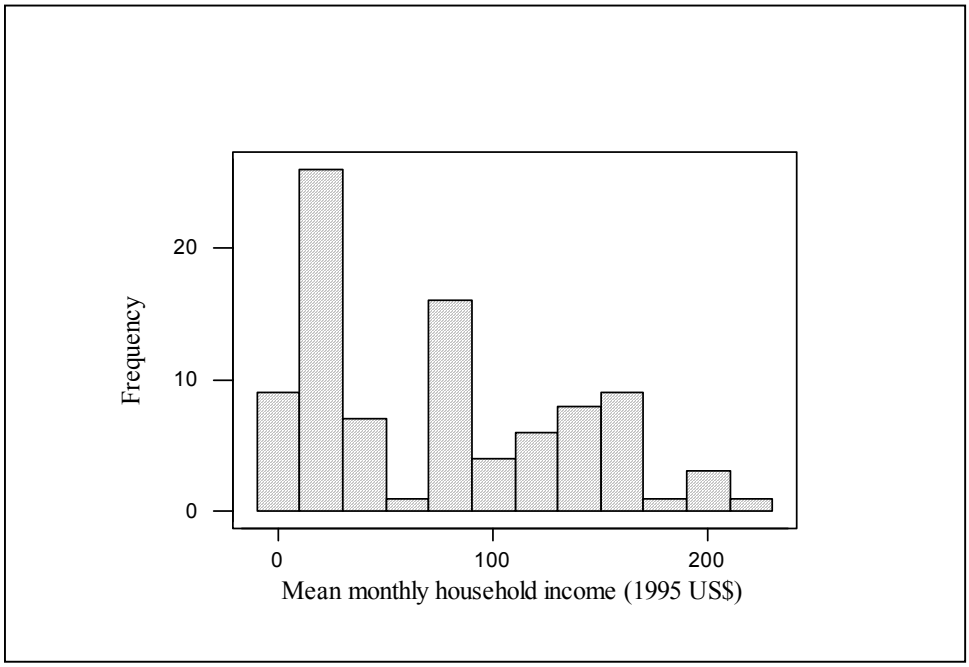


Figure 4 *Histogram showing the distribution of household monthly WTP*

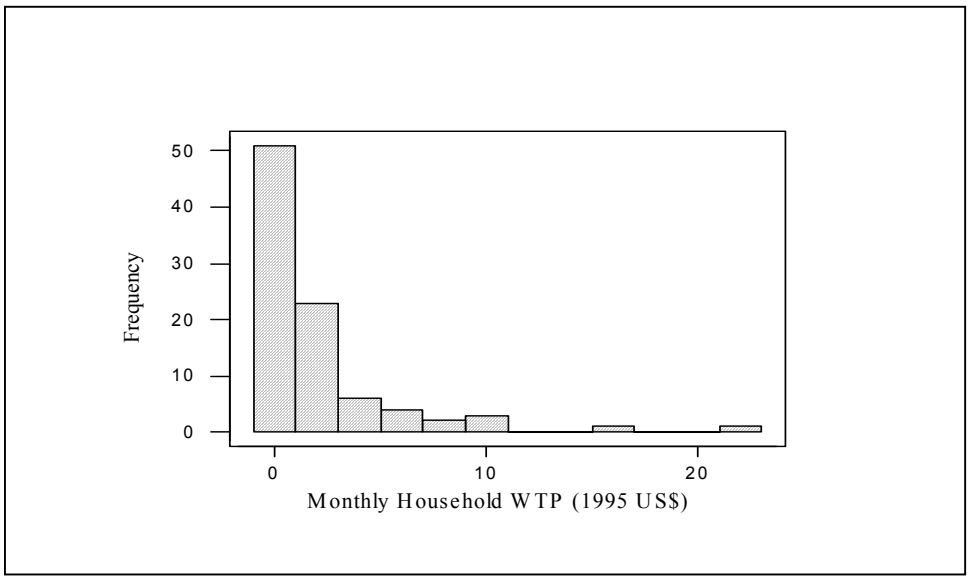
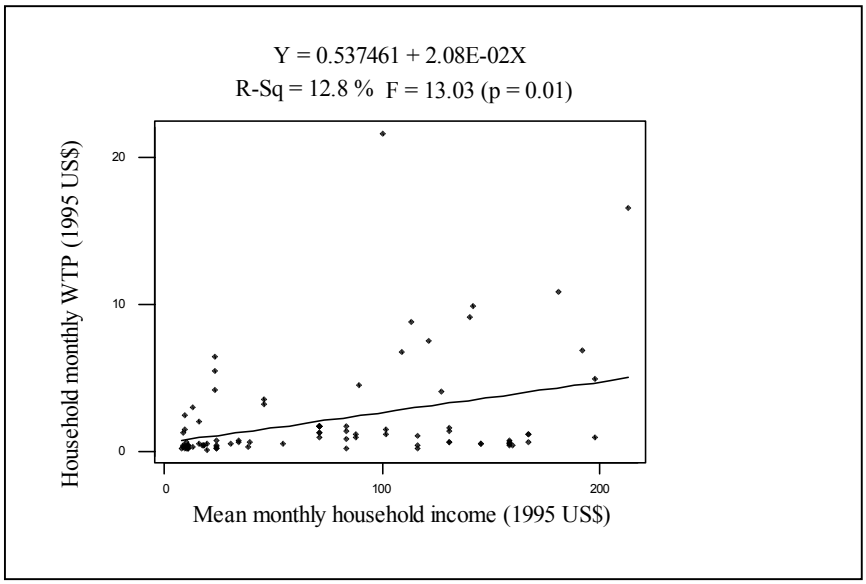


Figure 5 ***WTP as a function of monthly household income***



The relationship between income and WTP is shown more clearly in *Figure 5* by the scatter plot and best fit line of WTP as a function of monthly household income. *Figure 5* shows a generally positive, but poorly fitting relationship between WTP and income but the relationship (R^2 is 12.8% and this fit is significant at the 5% level). Moreover, one can clearly see the variability in stated WTP about the best-fit line and this variability appears to increase with income.

This suggests that:

- There may be other issues apart from income alone affecting WTP across these studies;

- Demand for water may be income elastic at higher levels of income.

The first point supports much of the literature on this issue.

The second point would make intuitive sense, as where income is low households are likely to use water primarily for meeting their 'basic need' requirements and thus will pay a relatively high price for water below that margin (i.e. for poorer households and in order to meet their basic needs, their demand for water is income-inelastic). At higher levels of income, however, households may be using water for non-essential purposes (such as for the operation of consumer durables or for recreational purposes). Consumption above the level deemed 'adequate' for a reasonable standard of living is therefore more likely to be sensitive to price. Water consumption thus displays the properties of a normal good with diminishing marginal returns at higher levels of consumption. Since price and income are related (as the price of one good increases, the amount of income available to spend on other goods and service decreases, *ceteris paribus*) it can be postulated that water demand

becomes more elastic as income increases and the use of water extends beyond that required for basic needs.
A regression equation (presented at the top of *Figure 5*) can develop our interpretation of these graphical findings statistically. It shows that even at zero levels of income, households value their water and are willing to pay US$0.50 for each extra unit of consumption or level of satisfaction associated with an improved quality of water. This is an interesting result and lends some weight to the argument of the DRA approach, which suggests that even at low-income levels, household payments can be forthcoming for services that match consumer preferences. The equation suggests that with every ten-dollar increase in income, households are willing to pay US$0.2 more for each unit of consumption.

Logging the relationship between WTP and household income allows one to determine the income elasticity of demand for water (the rate of change of WTP with respect to income) The log specification of the relationship yields the equation:

$$\ln Y = -2.22709 + 0.5403629 \ln X$$

Where Y is WTP (in US$) and X is household income (in US$).

In its simplest form, this reduced form regression provides a useful result to guide expectations and hypotheses about the implementation on cost recovery in certain low-income communities.

It shows that for every one percent increase in income, WTP increases by 0.54 percent. Thus, if income were to increase by 100% from, say, US$10 per month to US$20 per month, then WTP would only increase by 54 percent (from, say, US$0.05 to US$0.077, *ceteris paribus)*. This suggests that water is a relatively income inelastic normal good.

Household size and education
Household size varies from 3 to 12 members with an inter-study mean of 7 members. It is difficult to say what the effect of this large mean will have on the predicted mean WTP as it was not possible to include variables to explain the gender and age composition of households. Most households in the sample would appear to have been educated to at least a primary school level with a mean of six years of schooling. No households had a mean of less than two years of schooling and the most educated households had, at most, senior school qualifications.

The outcome of the Kruskal-Wallis test (*Table 11*) confirms the differences (at a five percent level or better) in WTP amounts according to the characteristics of the households in the samples.

E1.3.2 Water Service Characteristics

Over eighty percent of the households in the meta-dataset were offered a new, as opposed to an improved, service and 56% of the bids were for private connections. Just over one-third of the respondents were told that the recurrent costs for water would be worked out on the basis of their consumption levels and only two-thirds were told that an upfront installation and connection charge would be expected from them.

New or improved system
The median WTP was surprisingly higher among respondents offered an improved rather than a new water delivery system (*Table 11*). This may reflect an attitude that is up to Government to provide new services at no charge. It could also indicate a lack of awareness among respondents about the added benefits that a new service would bring over an upgrading of the systems that are currently in place.

This is not a significant difference, however. The results of the Kruskal –Wallis test (*Table 12*) do not substantiate at any conventional significance level the difference in median WTP values between respondents offered new over improved systems.

Private or communal connection
As could be expected, the median WTP was higher among respondents valuing a private connection rather than a communal one, possibly indicating that they have accounted for the opportunity costs associated with collecting water from distant sources.

Type of charge
Surprisingly, households were prepared to pay, on average, more for a flat rate than a volumetric rate. This may have come about if they did not understand how the volumetric system works or if they were opposed to paying the additional capital costs associated with the installation of an effective metering and charging system which requires efficient administration and management (Hazelton, 1997; Barrett and Sinclair, 1999). Households that were told that they would have to pay an upfront connection charge also provided lower median WTP values than those who were not. The differences in WTP are significant across these factors at a ten percent or better level of significance (*Table 12*).

E1.3.4 Summary

From an analysis of the how key variables in the datasets (location, income, service characteristics) relate to WTP bids, it seems that:

- WTP for service improvements can be extremely variable. It was significantly different depending on the location of the proposed project (higher for urban as opposed to rural; higher for humid as opposed to arid locations; and higher for middle as opposed to lower income countries).

- Mean WTP as a percentage of mean monthly household income is around 4%, but the variation is so large in incomes, as to render a mean value not useful to focus upon.

- WTP for the service improvements on offer is generally income inelastic. Drawn from these 25 studies, the pooled data indicates that for every one percent increase in income, WTP increased by 0.54 percent.

- WTP for the service improvements may become more income elastic at higher levels of income.

- Income alone, however, does not provide a good statistical explanation of WTP for service improvements.

- WTP was significantly higher for a private than for a communal charge; and for a flat rate charge rather than a volumetric charge.

- WTP was significantly lower when a connection charge was offered as part of the package.

E1.4 META-ANALYSIS REGRESSION RESULTS

E1.4.1 Regression Equation

The aim here is to see how, when combined, all of the variables in the cross sectional data together influence WTP.

The structure of the data used in the meta-analysis is quite complex. WTP values are generated by different studies, carried out in different geographical locations and using different valuation formats. Following the lead of several earlier meta-analyses of environmental evaluation studies (Boyle *et al*, 1994; Espey *et al*, 1997; Alston *et al*, 2000 and Poole *et al*, 1998), the basic relationship between WTP and the explanatory variables can be specified as:

$$WTP = b_0 + Xb + v$$

Where b_0 is the intercept, b is the vector of the slope co-efficients, X is the matrix of explanatory variables included in the model and v is the error term. Apart from the continuous variables of education, household size and income, all explanatory variables are dichotomous dummy variables, which indicate the presence or absence of particular characteristics.

As a preliminary step in specifying the model, the distributions of the continuous variables were investigated by plotting histograms. The reason for doing this was to assess whether or not any transformations were needed to normalise the distributions of the monetary variables if they were highly skewed and thus to make the relationship between the dependent variable

(WTP) and it explanatory variables more linear.[12] Given the shapes of the monetary variables, a logarithmic transformation was used and the predicted relationship became:

$$\text{Log WTP} = b_o + Xb + v \quad [13]$$

The logged WTP values were then regressed onto the explanatory variables using ordinary least squares (OLS). The regression output is displayed in *Table 13*.

E1.4.2 Regression Results

Table 13 shows a surprisingly high adjusted R-squared for cross sectional data[14]. The model F-statisticis significant below the one per cent level. Six of the explanatory variables are significant at the five percent level and a further two at the ten percent level. It is interesting to note, however, that not all the variables behaved as anticipated and to observe that the study site and design features are the most significant factors in explaining stated WTP. The results of the regression are explained more fully below.

Urban or Rural Location

When grouped with all the other explanatory variables, the most significant factor influencing WTP is the location of the study site – that is, whether the sampled household was located in an urban or in a rural area. WTP in urban areas was significantly higher than WTP in rural areas. It was expected that bids would be higher in urban than in rural areas because of a correlation with income and education levels and the fact that households living in close proximity may have learned of the benefits of an improved supply from their neighbours. They are thus more likely to understand the nature of the services being offered to them and are therefore more likely and willing to pay a higher amount for a new service. Also, households living in urban areas are more likely to be forced to pay for most of their water consumption or, where unimproved sources are available, they are likely to be heavily polluted.

In order to assess whether there was any correlation between income and location, the Pearsons correlation co-efficient was calculated for each of these relationships. The results are presented in *Table 14*. It shows a significant relationship between an urban location and higher incomes.

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[12] A more accurate method of testing for the necessity of transformations is to use the Box-Cox test. This involves scaling the observations on WTP so that the residual sum of squares (RSS) in the linear and log models are rendered directly comparable (Dougherty, 1992).

[13] The log specification of the model implies that the dependent variables should be interpreted as (1) an elasticity when the specification is log-linear (income) and (2) as a percentage effect on WTP of a small change in the independent variable when the specification is semi-log (all continuous variables except income). The parameter estimates for dummy variables are interpreted in terms of percentage effects on WTP of a *ceteris paribus* change from 0 to 1 in each particular variable (Halvorsen and Palmquist, 1980; cited in Santos, 1999).

[14] As a guide, the adjusted R squared statistic for many published meta analysis studies is rarely above 30%.

Climate

The second most significant factor is climate, although the negative co-efficient is contrary to expectations. The study found that WTP was higher in humid areas than in arid areas. Intuitively, one would expect households living in arid climates to be willing to pay more for their water supplies because of the greater amount of time needed to collect water from naturally occurring sources. It can, however, be counter-argued that households living in low rainfall regions will already have invested large amounts of money in storage tanks and may have evolved sophisticated coping strategies (Nyong and Kanaroglou, 1999). Where large investments have already been made, households may be unwilling to allocate more income towards piped services.

Robustness of Survey

The quality of the survey and the way questions were asked was an important explanatory factor affecting WTP. Studies carried out after the publication of the NOAA guidelines appear to have a significant influence on the WTP bids. This may be because respondents were provided with enough information (which they understood) to make an informed decision about the amount that they were willing to pay for the proposed service. The NOAA guidelines also recommend the use of closed-ended procedures, which have consistently shown to produce significantly greater mean values than open-ended ones, possibly as a result of respondents' uncertainty in answering the latter (Bateman *et al*, cited in Brouwer *et al*, 1997).

Neither the elicitation procedure nor the conduct method were significant at a ten percent level although the co-efficient suggest that using a stated preference approach would raise the WTP estimates by 66 percent with respect to revealed preference approaches and using an iterative procedure would lower estimates by 55 percent compared to using an open-ended format. It is unclear what effect an iterative bidding procedure would have on the responses *a priori* as using a bidding game provides respondents with benchmarks upon which to base their value estimates. Respondents who are faced with the interviewer might be tempted to inflate their responses in an attempt to 'comply' with the perceived expectations of the enumerator but using an iterative bidding game gives respondents an idea of the true expected value of the WTP bid thus reducing the likelihood of 'wild' estimates. The dichotomous choice format was developed to increase the incentive-compatibility of the valuation question (Brouwer *et al*, 1997) and matches the way consumers make choices in the market, giving respondents the proper incentives to reveal their 'true' preferences. The dichotomous choice format may, however, induce what has been called 'starting-point bias', that is, the initial bid amount offered to respondents may influence their response. Since there is no consensus on which format (open-ended or closed-ended) is less biased, the divergence between formats is interpreted as a reliability problem.

A robust WTP figure may be obtained by following NOAA guidelines in designing the survey and by using a closed ended, stated preference, yes-no

approach to asking for WTP bids. Starting point bias may be a problem, but a range of starting points within the survey can overcome this to an extent.

Education
Perhaps the most surprising result was the negative coefficient for education levels (significant at the five- percent level), implying that more highly educated households are less willing to pay.

One would expect that households with more years of schooling would have learned of the private and social benefits of improved water consumption. Furthermore, more-educated households are more likely to have members engaged in productive employment or to have a higher probability of finding employment, implying that the opportunity costs associated with collecting water from communal sources are also higher. This counter-intuitive finding may be an artefact of the data codification process. Alternatively, the rationale may be that richer households simply do not wait for municipality-wide solutions for water provision. Instead, as is commonly observed in well-off districts, richer households make their own provision and will be less likely to pay more money on improving supplies when they are satisfied with their existing arrangements. Whittington *et al* (1992b), based on an analysis by Hoehn and Randall (1987) note that one could expect that applying CVM to rural households with limited education would increase the frequency of incomplete responses and therefore potentially increase the importance of strategic considerations linking their informed values to their stated values.

In order to assess whether there was any correlation between income and education or education and location, the Pearsons correlation co-efficient was calculated for each of these relationships. The results are presented in *Table 14*.

From the results it can be seen that there is no significant correlation between locality and education although it is interesting to note the negative co-efficient, which suggests that education tends to be higher in rural areas than in urban ones. The small number of studies that were conducted in urban areas may be a cause of this counter-intuitive result. The high significance of the other tested relationships suggests that there is a positive relationship between income and education.

Income
Income is significant factor at the five-percent level affecting WTP for WATSAN service improvements within the studies. However, location, climate, education and the form of question on offer are all more significant explainers of WTP than income. An interesting observation from this meta-analysis regression, therefore, is that income is not the sole, key determinant explaining the variability of the WTP bids, although it is important.

In the regression, holding all factors constant, a one percent increase in income would increase WTP by 0.34 percent. This confirms that WTP for service improvements is also income inelastic.

(The figure for income inelasticity is not as low, however, than those found by the World Bank Water Demand Research Team in 1993. This study found the income elasticity of demand for access to improved services ranged from 0.07 in Zimbabwe through to 0.15 in Brazil[15]. This difference in findings between each of the World Bank studies and this meta-analysis may be due to the wide range of WTP bids and income levels contained across the 25 studies, which were pooled together for the analysis. Nevertheless, the fact that our desk study indicates income inelasticity existing *across* these different WTP papers, even given these ranges, is extremely interesting).

Controlling for the effects of systematic error, income is nevertheless an important determinant of demand, but in a less obvious manner than simply in terms of the sole driver for WTP.

For example, higher income people are in urban areas; and urban people are WTP more for a WATSAN service improvement; hence it seems easy to suggest that urban people are WTP more, because they have higher incomes. But, WTP is generally income inelastic, so poorer people in urban (and rural areas) are also WTP for the WATSAN improvement. Higher incomes are found in urban areas, but as WTP is income inelastic, other factors must also be contributing toward urban people being WTP more, such as a better awareness of the potential improvements of WATSAN; a better knowledge of other successful projects; or perhaps being in less sanitary surroundings than their rural counterparts.

Also, confounding the simple answer of income alone is the fact that the more educated people are WTP less for WATSAN improvements, and these are generally the people with higher incomes. Perhaps, they may have instigated their own improvements already, or perhaps they may not trust the solution on offer (this finding however is the reverse to the education –WTP link found by the World Bank 1993 study, and should be treated cautiously).

Hence, while it is clear that income is an important factor in explaining WTP, it is not the only – or the major – factor.

E1.4.3 Improving the model

Although the goodness-of-fit of the full model was reasonably high (R-sq. is 59.4%), a stepwise procedure was run to see whether the fit could be improved any more by sequentially removing those variables having the least explanatory power and then finding the combination of variables that yields the best fit. Two procedures were run, one in which all the variables that were significant at the ten per cent level or better were forced into the model and then another using all variables significant at the five percent level or better. Neither of the procedures improved the goodness-of-fit of the model and the best combinations of explanatory variables included all the variables that were

[15] World Bank Water Demand Research Team (1993) The Demand for Water in Rural Areas: Determinants and Policy Implications. World Bank Research Observer Vol 8, No.1 January 1993 pp51.

used in the full model. Thus, all tested variables add some explanatory power to the model even if only through second-order interactions.[16].

However, the results of the OLS regression must be viewed with several caveats in mind. The structure of the data used in the meta-analysis is quite complex. WTP values are generated by different studies, carried out in different geographical locations and using different valuation techniques. Using the summary statistics of these different studies in a pooled sample, the usual conditions required for Ordinary Least Squares (OLS) are likely to be violated. Two types of potential problems with the regression errors that might affect the OLS estimates are considered.

Firstly, the nature of the data may give rise to heteroskedasticity where the standard deviations of the errors differ across observations. There are three main reasons why this should occur:

- Variation within studies due to measurement error (inaccurate recording of information by enumerators and mistakes in the calculation of mean sample values);

- Inter-study variation (as a result of the diverse methodologies employed);

- Sample size discrepancies (mean WTP bids are likely to be more representative of the total population where the sample size is greater). The observation sample sizes across the studies in the meta-dataset ranged from 13 to 968 and thus it could be argued that greater weight should be attached to the values obtained from the larger sample sizes.

From a precursory overview of the meta-database it appears that the small sample sizes correspond to sub-samples or independent observations within the studies. That is, small sample sizes generally correspond to independent observations taken from villages or from sub-sectors of the study population whereas the large sample sizes usually correspond to studies where one observation was made for an entire district or region. Considering the 'scope test', there is little reason for the large sample sizes to be any more representative of their study populations than the smaller ones are of theirs: the proportion of the sample populations to the true populations could be approximately equal across studies[17].

Poe *et al* (2000) suggest that instead of treating each unique value as an equally weighted observation, each study could be given equal weight so that a study

[16] Omitting variables can also introduce bias. If explanatory variables that should have been present in the regression are omitted, and if these omitted variables are correlated with any of those that are included, then the co-efficients on the included variables will be incorrect (Koop, 2000). Nevertheless, the counter-argument can be made for using as *few* explanatory variables as possible. It can be shown that the inclusion of irrelevant variables decreases the accuracy of the estimation of all the co-efficients (Koop, 2000).

[17] It was mentioned before that many studies did not indicate the 'scope' of their studies and so it is difficult to assess how representative the samples are, *ceteris paribus*.

with twelve observations would have as equal weight as a study that provides only one or two observations. Adopting an equal weight approach across studies dilutes the effects of additional within-study variations (Poe *et al*, 2000). Since each observation was treated as an independent sub-sample it was not considered necessary to adopt such an approach.

E1.5 DISCUSSION

An attempt has been made to analyse the results from contingent valuation studies obtained from twenty-five studies related to water and sanitation in developing countries by undertaking a quantitative meta-analysis. The key issue analysed across the studies was what affects peoples WTP for WATSAN improvements (essentially the common good on offer across all of the studies, ignoring the particular design details of the different projects).

The results showed that there is a significant degree of variability in WTP estimates across the studies, possibly attributable to the particular methodologies that were used to solicit responses, or to the wide variation in income levels and other socio-economic characteristics prevalent within and between the studies.

In relation to income, however, these data confirm that WTP for WATSAN improvements is relatively income inelastic – that is the WTP for improvements does not increase in percentage terms by the same amount as income. This is to be expected because water is typically an inelastic normal good (meaning that we do not consume ever larger quantities as income rises). However, the estimated income elasticity of WTP does provide some guidance on the relative amounts of contribution that can be expected from low-income households and what recovery rates might be expected for different income bands. The findings suggest that for every 100% rise in income, WTP for a WATSAN service improvement will increase by between 34 and 54 percent. There does seem to be an indication, however, that towards the higher end of the income scale, WTP for improvements becomes more elastic (i.e. more related to income). Hence, the findings suggest that although richer people will pay more for a WATSAN improvement, in relation to their income, it doesn't follow on a linear scale that poorer people will pay less.

Recalling that we are talking predominantly about access to water for cash based charge; we can say that the cash constraints of lower income households would need to be addressed as part of the cost recovery debate. This is important to turn the relatively higher desire to pay for a WATSAN improvement in relation to income for poor people into actual payments.

The study cannot reveal much about volumetric entitlements although it can be assumed that higher income groups may have more "luxury" uses of water. With their basic needs met, a volumetric charging structure would seem appropriate for this group, although overall, this payment schedule has a negative influence on WTP in general.

The type of connection option was also important. WTP was significantly higher for a private than for a communal charge and for a flat rate charge rather than a volumetric charge and WTP was significantly lower when a connection charge was offered as part of the package.

Other factors, however, appear more important than income. Influencing WTP more significantly than income, included:

- Being in an urban setting (raised WTP),
- Being in an arid environment (lowered WTP),
- Operating a "robust" WTP survey (lowered WTP)
- Being educated (lowered WTP)

There may be issues of data coding causing a few problems here, or other reporting issues to do with the data or the interpretation of the variables that creates some of these seemingly counter-intuitive results.

Nevertheless, while controlling for the effects of systematic error as far as possible, it does seem clear from the meta-analysis that the driver of WTP for WATSAN improvements is more than income on its own. For example, higher income people are in the urban studies; and people in the urban studies are WTP more for a WATSAN service improvements than those in the rural studies. Hence, it seems easy to suggest that urban people are WTP more, because they have higher incomes. But, WTP is generally income inelastic, so poorer people in urban (and rural areas) are also WTP about the same for the WATSAN improvement. Higher incomes are found in urban areas, but as WTP is income inelastic, other factors must also be contributing toward urban people being WTP more. Maybe these indicate a better awareness of the potential improvements of WATSAN; a better knowledge of other successful projects; or perhaps are the result of being in a less sanitary urban surrounding than their rural counterparts.

E1.6 ENDNOTE - THE CONTINGENT VALUATION METHOD

The contingent valuation method (CVM) is a survey technique[18] that attempts direct elicitation of individuals' (or households') preferences for a good or service. It does this by asking the respondents in the survey a question or a series of questions about how much they value the good or service. People are asked directly to state or reveal what they are willing to pay to gain or avoid some change in provision of a good or service; and/or what they are willing to accept to forego a change or tolerate a change.

A contingent market defines the good itself, the institutional context in which it would be provided, and the way it would be financed. The situation the respondent is asked to value is hypothetical (hence, contingent'), although

[18] For a detailed review of the Contingent Valuation Method, see Mitchell and Carson (1989) and Carson (2000).

respondents are assumed to behave as if they were in a real market. Structured questions and various forms of bidding game can be devised involving yes/no answers to questions regarding maximum willingness to pay. Econometric techniques are then used on the survey results to find the mean bid values of willingness to pay.

Over the last two decades, interest in CVM has increased for a number of reasons (see Carson 2000). First, a stated preference approach is the only means available for valuing 'non-use' (or passive use) values, such as people's existence values for a unique natural habitat or wilderness area. Second, the evidence available suggests that estimates obtained from careful and well-designed, properly executed surveys appear to be as good as estimates obtained from other methods. Thirdly, the design, analysis and interpretation of surveys have improved greatly with advances in scientific sampling theory, benefit estimation theory, computerised data management and public opinion polling.

In developing countries CVM has been applied widely in the field of WSS planning. The complex range of WSS benefits means that the method is an appropriate form of inquiry for eliciting community preferences for as yet hypothetical supply options. But the hypothetical format of the approach is also the root of existing criticisms of the method. Interestingly, the method is convergent with the DRA agenda, which requires the elicitation of household willingness to pay.

E1.6.1 Design of a CVM study

In designing a CVM study, one has to answer a number of questions relevant to contingent valuation research in general. These include:

- What change in service provision or quality should respondents be asked to value, and how should this change be described to them?
- What type of interview format should be used in the survey (i.e. face to face, telephone, or mail)?
- What type of questions (elicitation procedure) should be used to elicit respondents' valuation of the change in provision?
- Exactly how should respondents be told that they would have to pay for the change in provision?
- How can we increase our confidence that respondents in the contingent valuation survey are actually valuing the specific change in service quality described and not some other environmental quality change, and furthermore, that the values found are correct?

There is an extensive literature on designing CVM surveys including a review of application problems in developing countries (Whittington 1998). Two application problems seem to stand out. The first relates to the potential disparity between willingness and ability to pay (see section). The second is the fact that in considering the level of service to offer a community it is

somewhat difficult to breakdown the drivers of demand (WTP) using CVM. In other words, considering the service offered to a community as a bundle of attributes (e.g. quality, volume, distance, price), contingent valuation might let us know how a household values a particular combination of attributes, but it is less able to reveal the WTP for specific attributes in isolation.

Table 1 studies included in the analysis

Author	Publication Details	Year of Study	Study Site	Number of Observations
Goldblatt	*Geoforum* , 1999	1994	Johannesburg, South Africa	2
Boadu	*Journal of Agricultural Economics*, 1992	1991	Ghana	12
Whittington, Lauria, Wright, Choe, Hughes and Swarna	*Water Resources Research*, 1993	1989	Kumasi, Ghana	1
Whittington, Davis and McClelland	Paper prepared for submission to *Water International*, 1998	1994	Lugazi, Uganda	8
Whittington, Lauria and Mu	*World Development*, 1991	1987	Onitsha, Nigeria	1
Whittington, Smith, Okorafor, Okore, Liu and McPhail	*Journal of Environmental Economics and Management*, 1992	1989	Anambra, Nigeria	4
Whittington, Okorafor, Okore and McPhail	*Water Resources Research*, 1990	1989	Anambra, Nigeria	6
Wasike and Hanley	*Water Resources Development*, 1998	1995	Webuye, Kenya	4
McPhail	*Journal of Water Resources Planning and Management*, 1993	1990	Rabat, Morocco	1
McPhail	*World Development*, 1993	1990	North central Morocco	5

Author	Publication Details	Year of Study	Study Site	Number of Observations
McPhail	*Land Economics*, 1994	1990	Tunisia	1
Singh, Ramasubban, Bhatia, Briscoe, Griffin and Kim	*Water Resources Research*, 1993	1988	Kerala, India	3
Griffin, Briscoe, Singh, Ramasubban and Bhatia	*World Bank Economic Review*, 1995	1988	Kerala, India	3
Ramasubban	DFID/RWSG-SA report on a Workshop on Willingness to Pay for Drinking Water Supply and Sanitation, 1997	1988	Kerala, India	3
Reddy	*Development and Change*, 1999	1993	Rajasthan, India	6
Anand and Perman	*Journal of International Development*, 1999	1996	Madras, India	1
Asian Information Marketing and Social Research	DFID/RWSG-SA report on Willingness to Pay for Drinking Water Supply and Sanitation, 1997; originally part of a study on WTP for Improved Water Supply, Sanitary Latrines and Sewage Systems for Rural Households commissioned by the Punjab Public Health and Engineering Department, Patiala and the World Bank, 1996	1996	Punjab, India	1
Vaidya	DFID/RWSG-SA report on Willingness to Pay for Drinking Water Supply and Sanitation, 1997	1996	Baroda, India	1
Altaf, Whittington, Jamal and Smith	*Water Resources Research*, 1993	1988	Punjab, Pakistan	12
Altaf, Whittington, Jamal and Smith	*UNDP-World Bank Water and Sanitation Report*, 1992	1988	Punjab, Pakistan	12
Altaf	*Third World Planning Review*, 1994	1989	Punjab, Pakistan	3
Altaf	*Habitat International*, 1994	1990	Gujranwala, Pakistan	2
North and	*Water Resources*	1978	Bicol,	3

Griffin	*Research*, 1993		Philippines	
Author	**Publication Details**	**Year of Study**	**Study Site**	**Number of Observations**
Bohm, Essenburg and Fox	*Water Resources Research*, 1993	1987	Philippines	5
Briscoe, de Castro, Griffin, North and Olsen	*World Bank Economic Review*, 1990	1987	Brazil	9
Whittington, Briscoe, Mu and Barron	*Economic Development and Cultural Change*, 1990	1986	Southern Haiti	2
Aguilar and Sterner	Paper prepared for the Unit for Environmental Economics, Göthenburg, Sweden, 1995	1993	Limon, Costa Rica Guanacaste, Costa Rica	2
Hardner	*Water Resources Bulletin*, 1996	1995	Ecuador	1

Table 2 Number of observations from studies

Number of Observations	Number of Studies
1	8
2	4
3	4
4	2
5	2
6	2
7	0
8	0
9	1
10	0
11	0
12	2
Total: 91	Total 25

Table 3 Coding the type of study

Variable	Variable Description	Mean (Standard Deviation)	Minimum	Maximum
Study Design and Site Characteristics				
Date	1 = study was carried out after 1993	0.2747 (0.4488)	0	1
Authors	1 = Whittington was on research team or the author of the study had worked with him on an earlier WTP study	0.5934 (0.4939)	0	1
Sample Size	Number of households interviewed in each observation	179.9 (193.9)	13	968
Region	1 = middle-income; 0 = lower income	0.3187 (0.4685)	0	1
Climate	1 = arid climate; 0 = humid climate	0.3187 (0.4685)	0	1
Locality	1 = urban; 0 = rural	0.2143 (0.4024)	0	1
Conduct Method	1 = contingent valuation methodology/stated preference	0.8956 (0.3029)	0	1
Elicitation Procedure	1 = bidding game was used	0.7363 (0.4431)	0	1
Time-to-Think	1 = respondent was not given time to think	0.9754 (0.1492)	0	1
Household and Respondent Characteristics				
Household Size	Mean number of people living in the household	6.848 (2.102)	3.16	12.010
Education Level	Mean number of years of schooling of the household	6.135 (1.985)	2.128	9.000
Household Income	Mean monthly household income in 1995 US$	73.88 (60.13)	8.17	212.86
Log Income	Log of monthly household income	3.837 (1.072)	2.1	5.361
Water Supply Characteristics				
Service Type Offered	1 = new; 0 = improved	0.8131 (0.3766)	0	1
Level of Service bid for	1 = private connection	0.5636 (0.4908)	0	1
Recurrent Cost Charging Arrangement	1 = respondents were told that the charging system would be based on volume of water used per month	0.3516 (0.4801)	0	1
Connection Cost Arrangement	1 = respondents were told that an installation charge would be levied and that it would be required as an upfront payment	0.6703 (0.4727)	0	1

Variable	Variable Description	Mean (Standard Deviation)	Minimum	Maximum
Dependent Variable (WTP) Characteristics				
WTP bid	Mean monthly bid of all households in the observation in 1995 US$	2.077 (3.507)	0.030	21.620
Log WTP		-0.154 (1.296)	-3.507	3.074
WTP as a % of income	Mean WTP as a % of mean monthly household income	3.969 (5.850)	0.086	27.958
Log WTP as a % of income		0.614 (0.605)	-2.453	3.331

Table 4 Summary statistics by study characteristics

STUDY CHARACTERISTIC	MEDIAN WTP (1995 US$)	N
Date		
Pre-1993	0.62	66
Post-1993	0.7	25
Authorship		
Whittington included	1.075	54
No Whittington influence	0.44	37
Conduct Method		
Contingent Valuation Methodology	0.91	81
Revealed Preference	0.3	10
Elicitation Procedure		
Open-ended	0.55	24
Closed-ended	0.7	67
Time-to-think	0.17	2
No time to think	0.735	89

Table 5: The determinants of demand for new and improved water supplies

CROSS-REFERENCE FACTORS AND FACTOR LEVELS			
Variable	**Description**	**Expected Sign**	**Hypothesis**
Sample Population Characteristics			
Household Size	Continuous variable measuring the number of people in a household. Children younger than 12 years of age are usually counted as half-adults	?	• The relative need for 'basic needs' water is greater per household where there are more members; therefore, WTP for water is likely to be higher *ceteris paribus*. • The more family members there are, the more labour there is available for collecting water; therefore, WTP for new or in-house connections is lower, *ceteris paribus*.

Proportion of Adult Females	An index of the number of adult females in the household as a percentage of total adult members	?	• Most household activities which require water (washing, cooking) are performed by women whom are also most likely to be familiar with the health benefits of higher quality supplies. They are also usually the ones who have to collect water and would thus place a higher value on a more convenient source. • Since fetching water is often a women's chore, the more women in the household, the more labour is available for collecting water; hence, WTP for new services will be lower, *ceteris paribus*..
Number of Children	A continuous variable showing the number of children in the household who are strong enough to assume water-related responsibilities such as fetching and carrying	-	• The greater number of children in the household who can assume water collection responsibilities, the lower the opportunity costs of fetching water and hence, the lower the value placed on more conveniently located supplies, *ceteris paribus*.
Monthly Household Income	A continuous variable measuring the total average income earnings of the household during one month	+	• Microeconomic theory of consumer behaviour shows demand to increase with income, *ceteris paribus*, and where water is a normal good.
Assets/Wealth	A continuous proxy indicator of income measured by observation of a pre-specified set of consumer durables	+	• As above, the relative wealth of a household is likely to be a reflection of the amount of money available for spending on improved services, *ceteris paribus*.
Tenure	A dichotomous variable to indicate whether the family rents or owns their present dwelling (1 = owner)	+	• Families that own their homes are more likely to be willing to invest in their properties and thus will pay more for a domestic connection, *ceteris paribus*.

CROSS-REFERENCE FACTORS AND FACTOR LEVELS			
Variable	**Description**	**Expected Sign**	**Hypothesis**
Landlord in house	Dichotomous variable to indicate whether or not the landlord lived on the property (1 = landlord lives on property)	+	• Where the landlord is present on the property, respondents may feel that it should be the responsibility of the landlord to invest in piped supplies and will therefore be less willing to contribute, *ceteris paribus*.
Education	A continuous variable measuring the mean years of schooling of the household	+	• Households with higher mean years of schooling are more likely to have been educated in the benefits of water consumption for hygiene purposes and thus will be willing to pay more for the resource, *ceteris paribus*. • Households with higher education also tend to face higher opportunity costs for collecting water (their labour has potential to earn higher returns elsewhere) and so will pay more for a convenient water service, *ceteris paribus.*
Occupation	A dichotomous variable to indicate whether the household is involved primarily in market-gardening/trading activities or whether main income earners have professional jobs or not (1 = office jobs and 1 = agricultural/petty trading)	+	• Households where the main income earners are involved in office-based activities are likely to have higher income levels and face higher opportunity costs and will therefore be willing to pay a higher price for new services, *ceteris paribus*. • Where the household is primarily subsistence based or petty-commodity production based, and where these activities take place around the home, the greater amount of water will be required and thus its marginal value will be higher, *ceteris paribus*..
Respondent Characteristics			
Age	Continuous variable measured in years	-	• Older respondents who have traditionally obtained water from unimproved, "free" resources may dislike the idea of having to pay for water and thus will offer a lower WTP bid, *ceteris paribus*.
Head of Household	Dummy variable measuring whether or not the respondent was the head of the household (1 = household head)	?	• Where the respondent is the head of household he/she is likely to have control over the household budget and will thus know how much money is available for spending on new or improved supplies.
Gender	A dummy variable to specify whether the respondent was male or female (1 = male)	–	• Where the head is a female, and is thus usually more involved with water-using activities around the house, WTP is likely to be higher, *ceteris paribus*.

CROSS-REFERENCE FACTORS AND FACTOR LEVELS			
Variable	**Description**	**Expected Sign**	**Hypothesis**
Water Supply Characteristics			
Satisfaction with existing source	An index to express the degree of satisfaction of the household with its existing services in terms of reliability, physical quality of water and convenience. Sometimes recorded as a referendum dummy (i.e. yes/no)	–	• Where households are satisfied with their current quality of supply (physical attributes, convenience and reliability) they will value new or improved supplies less highly than a household that is dissatisfied with current service levels, *ceteris paribus*.
Existing expenditure on water	A continuous variable to measure the amount of money that the household is currently spending on obtaining water	?	• The price of the new/improved scheme and perceived opportunity costs saved with respect to added convenience and reliability will largely determine the household's preferences for a new level of service.
Storage Capacity	Usually expressed as a dichotomous variable to show the ability of the household to collect and store water in times of relative plentiful supply (during the rainy season) (1 = capacity to store > 500 gallons of water)	–	• The greater amount of storage space the house has to collect water and store it for long periods of time, the less valued a convenient source of water is likely to be, *ceteris paribus*.
Vending	A dummy variable to indicate whether or not the household purchases water from vending distributors or kiosks to supplement other possible supplies (1 = vendor is primary source)	?	• The presence of vending activities has an ambiguous effect on WTP. Where proposed services can match the convenience and quality of vended supplies then and where the price of the proposed project water is similar to that of purchased water, then WTP is likely to be higher. WTP is this likely to relatively high for private connections, *ceteris paribus*. • Where the proposed service offers no added convenience and is priced higher than current supplies, then WTP is likely to be lower, *ceteris paribus*.
Distance from Source	Variously expressed as either a dichotomous or a continuous variable to indicate the distance in metres of the household from its primary source of water (1 = distance is > 200m where a dummy variable)	+	• The further away from the water source the household is, the more likely a higher value will be placed on more convenient and reliable services, *ceteris paribus*.
Time spent collecting water	A continuous variable to measure the time (in minutes) that the household spends in collecting water each day	+	• One would expect WTP for more-conveniently located and reliable supplies to be greater, *ceteris paribus*, where the amount of time spent collecting water is currently large.

Characteristics of service offered	A dummy variable indicating whether the service offered was for a piped in-house connection or a public service (1 = in-house connection)	+	• Higher values are likely to be placed on private as opposed communal supplies because of the added convenience and quality.
Attitude to water provision			
Government responsibility	Dummy variable to indicate whether the respondent believes that the provision of water services is the responsibility of the public sector (1 = government should provide services)	–	• Households believing that water is a basic human right and that its supply is the responsibility of government are less likely to invest in improving supplies, *ceteris paribus*.
Metering	Dummy variable to show whether the household agrees with the concept of being charged for water or whether it should be provided free of charge (1 = agree with charging principles)	+	• Where households agree with the concept of being charged for water, their stated WTP for water is likely to be higher than those who believe that water should be provided free of charge, *ceteris paribus*.

Table 6 Studies by income band and number of observations

ry	Gini Indicator[19]	Number of Studies	Number of Observations	Median WTP 1995 US$
Low Income				
Ghana	32.7	2	13	0.43
Kenya	44.5	1	4	1.03
Nigeria	50.6	3	10	0.16
Pakistan	31.2	5	17	0.94
India	37.8	3	12	0.6
Haiti	-	1	2	0.35
Lower Middle Income				
Morocco	39.5	2	6	8.91
Tunisia	40.2	1	1	4.04
Philippines	46.2	2	8	0.4
Costa Rica	47	1	2	3.33
Ecuador	43.7	1	1	21.62
South Africa	59.3	1	2	6.82
Brazil	60	1	9	1.63

Table 7 Summary statistics by study site

CHARACTERISTIC	MEDIAN WTP (1995 US$)	N
Region		
Lower income	0.53	62
Middle income	1.63	29
Locality		
Urban	5.16	21
Rural	0.53	70
Climate		
Arid/semi-arid	1.04	62
Humid	0.44	29

Table 8 Results of the Kruskal-Wallis test for study design and elicitation factors

Hypothesis	Date		Author		Conduct Method*		Elicitation Procedure		Time-to think*	
	H	*p*	H	*P*	H	*p*	H	*P*	H	*p*
H_0: equality of average WTP in all groups	0.65	0.418	4.53	0.033	15.67	0	0.65	0.42	4.76	0.093

*One or more small samples

[19] Source: World Bank World Development Report, 2000. The Gini co-efficient is an indicator of the degree of income inequality based on the Lorenz curve which related income to the percentage of income recipients in different income brackets. If income is equally distributed then the Lorenz curve is a 45 degree line such that 100% of the population is earning 100% of the income. Where this is not the case, the Lorenz curve will lie below the 45 degree line. The coefficient is the quotient of the area between the 45 degree (perfect equality) line and the Lorenz curve and the total area under the perfect equality line (Todaro, 1994). Thus the higher the quotient the more unequal the distribution of income.

Table 9 *Results of the Kruskal-Wallis Test for study site features*

Hypothesis	**Region (low or middle income)**		**Locality (urban or rural)***		**Climate (arid or humid)**	
	H	*P*	H	*p*	H	*p*
H_o: equality of ave WTP in all groups	15.89	0.000	19.42	0.000	10.64	0.001

* one or more small samples

Table 10 *Results of the Kruskal-Wallis test for household characteristics*

Hypothesis:	**Household Income**		**Household Size**		**Education**	
	H	*p*	H	*p*	H	*p*
H_0: equality of ave WTP in all groups	73.11	0.007	67.75	0.001	67.66	0.000

Table 11 Summary statistics of the proposed water supply characteristics

CHARACTERISTIC	MEDIAN WTP (1995 US$)	N
Service level offered		
New	0.55	76
Improved	1.04	15
Service type		
Private	1.21	53
Communal	0.53	38
Proposed tariff system		
Flat rate	0.74	32
Volumetric	0.55	59
Connection charge arrangements		
Upfront	0.57	30
Amortised/ not mentioned	0.90	61

Table 12 Results of the Kruskal-Wallis test for water service characteristics

Hypothesis	Proposed Change (new or improved)		Service Level (Private or communal)		Tariff System (Flat or volumetric)		Connection Charges (upfront or implicit)	
	H	*P*	H	*p*	H	*p*	H	*p*
H_o: Equality of ave WTP among groups	7.50	0.277	7.14	0.068	6.3	0.012	4.73	0.03

Table 13 Results of the regression

Explanatory Variable	Description	Co-efficient (Standard Deviation in Parentheses)	T-Statistic	P value
Constant		-2.577 (1.195)	-2.16	0.034
Date	Dummy: 1= after 1993; 0 = otherwise	0.8332 (0.3305)	2.52	0.014
Authors	Dummy: 1 = Whittington involved in study; 0 = otherwise	0.3333 (0.2855)	1.17	0.247
Region	Dummy: 1 = middle-income country; 0 = low-income country	0.7689 (0.4391)	1.75	0.084
Locality	Dummy: 1 = urban; 0 = rural	1.2184 (0.3093)	3.94	0.000
Climate	Dummy: 1 = arid/semi-arid; 0 = tropical/temperate	-1.3040 (0.4461)	-2.92	0.005
Conduct Method	Dummy: 1 = CVM; 0 = otherwise	0.6646 (0.5872)	1.13	0.261
Elicitation Procedure	Dummy: 1 = Closed ended; 0 = open-ended	-0.5098 (0.3142)	-1.62	0.109
Time-to-think	Dummy: 1 = respondent was not given time to think	0.6505 (0.7214)	0.90	0.370
Household Size	Continuous: number of people	0.12446 (0.07538)	1.65	0.103

Explanatory Variable	Description	Co-efficient (Standard Deviation in Parentheses)	T-Statistic	P value
	in household			
Education	Continuous: mean number of years schooling of household	-0.14675 (0.06555)	-2.24	0.028
Service level offered	Dummy: 1 = new; 0= improved	-0.1879 (0.2882)	-0.65	0.517
Proposed System	Dummy: 1 = private; 0 = communal	-0.0604 (0.2814)	-0.21	0.831
Proposed Charging Arrangement	Dummy: 1 = volumetric: 0 = flat rate	-0.5206 (0.3048)	-1.71	0.092
Connection charge Information	Dummy: 1 = charges amortised into recurrent cost tariff; 0 = respondent was told that up-front payment would be required	0.1960 (0.2788)	0.70	0.484
Log of income	Continuous: log of income measured in 1995 US$	0.3488 (0.1673)	2.08	0.041

N = 91
R-Sq. = 59.4%
R-Sq. (adj.) = 51.3%

Analysis of Variance

Source	DF	SS	MS	F	P
Regression	15	89.7459	5.9831	7.32	0.000
Residual Error	75	61.3334	0.8178		
Total	90	151.0793			

Table 14 Results of the Pearsons Correlation Test

Variable combination	Correlation co-efficient	p-value
Income // Education	0.266	0.031
Locality // Education	-0.103	0.332
Locality // Income	0.322	0.002

Annex F

Cost Recovery in Water and Sanitation Projects – Lessons from India

F1 COST RECOVERY IN WATER AND SANITATION PROJECTS – LESSONS FROM INDIA

F1.1 INTRODUCTION

In November 2001, as part of the KAR project, ERM met with key WATSAN stakeholders in India to discuss the research themes of the project and the issue of cost recovery in water and sanitation projects more generally in India.

F1.1.1 General Background to WATSAN Cost Recovery in India

A report by the UNDP/ World Bank Water and Sanitation Programme (WSP) South East Region entitled *"Water for India's Poor – who pays the price for broken promises?"* neatly summarises the differences between political promises and the reality regarding water supply in India. Another paper, *"Willing to pay, but unwilling to charge"* also summarises the political obstacles within India to decentralising water and sanitation services and charging consumers. Together, they usefully frame the cost recovery debate on WATSAN in India.

Politically, water supply has remained a state responsibility since independence. Political promises on state supplied WATSAN centre on the following four conceptual points:

- The poor cannot afford safe water and sanitation and should not have to pay for it;
- Public subsidies are provided to help the poor pay for water and sanitation;
- The Government of India can solve the problem of water supply by running water and sanitation programmes itself; and
- The Government of India can raise the financial resources needed for water supply and sanitation.

The WSP, however, in these publications suggest that reality is more akin to the following:

- The poor in India actually do pay for water supply and sanitation, often far more than their fair share;
- The subsidies for water supply and sanitation benefit mainly those who are not poor;
- Public provision on water supply is inefficient and ineffective; and
- The investment requirements for water supply and sanitation in India are far too great for the Government of India to afford.

The WBWSP have also gathered together a large amount of evidence from a number of studies and practical experience across India, which indicates that many urban and rural communities are willing to pay for water and sanitation services. Many people are often paying more, in fact, than the official tariff through informal channels and coping mechanisms and would be happy to pay for a better, more reliable service. However, the WBWSP suggests that there is sluggishness within policy makers to respond to this evidence. Political commitment to tariff reform is seen as critical.

Hence the situation in India is of great pertinence to this study, both in terms of the size of the problem in India itself, and because the key issues identified by the WSP in India reflect, support or complement the findings of the KaR study. Namely:

- It may be important to think less about absolute incomes (whether people can afford water supply and sanitation services or not) and more about designing convenient ways of helping people to pay for the water supply and sanitation services they want.

- The key issue affecting cost recovery of WATSAN investments was found to be political interference. Thus, any examples of projects in India that have surmounted these obstacles would be of great interest, not only within an Indian context but also in terms of the wider replicability of their approach to resolving these problems.

F1.1.2 Policy Background to Rural Water Supply and Sanitation in India

There is a long and complex policy history to rural water supply and sanitation in India, and an overview and summary of the key policy and institutional issues are presented in the two boxes below. In short, there has been a (arguably unsuccessful) history of State level provision of services since independence, which is giving way now to a more decentralised and community-focused model of implementation. Cost recovery, partly of capital costs and mostly of O&M costs, now plays a significant part in this decentralisation process.

Box 0.1 A brief history of water supply in India, with respect to cost recovery

Chronology

- A national WATSAN programme was introduced in the social welfare sector in 1954. The basic premise continues to be that the provision of safe drinking water is the responsibility of the Government.
- Under this programme, funds are provided from the State budgets for drinking water supply as a part of every five-year plan.
- The Federal Government funded Accelerated Rural Water Supply Programme (ARWSP) was introduced in 1972-3 and again in 1977-8. Implementation continues. The aim of ARWSP is to supplement the efforts of State Governments in providing rural water supplies, through 100% aid grants from Central Government.
- A Mission approach to the water supply programme was created in 1986; this became the Rajiv Ghandi National Drinking Water Mission (RGNDWM) in 1991.
- 73rd Constitutional Amendment Act of 1992 (effective April 1993) legally transforms Panchayat Rai institutions into institutions of self-government for rural areas. Out of the 29 duties the Panchayat became responsible for, no.9 relates to drinking water and no.13 relates to health and sanitation. Individual state legislation follows this up to greater or lesser degrees over subsequent years (e.g. Kerela Pahnchayat Rai Act, 1994). The way is paved, therefore, for community owned and managed water supply and sanitation systems in theory.

Other issues

- ARWSP has a target norm of 40 litres pp pd.
- Up to 15% of ARWSP funds released each year can be used for O&M costs, as can 15% of another Government grant programme – the Minimum Needs Programme.
- Sector Reforms are looking for increased community participation in rural water supply programmes. They suggest the failure of water service coverage and reliability is due to the perception of water as a social right to be provided free. Instead the reforms are looking for recovery of O&M and replacement costs from users.
- 20% of ARWSP annual outlay is now earmarked as an incentive for those State Governments that take a demand driven approach to WATSAN implementation; that build Village Water and sanitation Committees; and that attain 10% capital cost sharing and 100% O&M costs from their recipient villagers.

Box 0.2 Revised guidelines for the rural water supply programme

Prepared with the support of the World Bank, these Guidelines help to revise the rural water supply programme and also suggest that:

- Panchayati Raj institutions should be encouraged to adopt the concept of community participation in the development of their rural water supply programmes.
- Institutionally there is a State Water and Sanitation Mission; a District Water and Sanitation Mission; a Gram Panchayat Water and Sanitation Committee and a Village Water and Sanitation Committee. The State Mission should provide policy guidance, auditing and evaluation; the District Mission should coordinate the receipt of central funds and the selection of water supply agencies to deliver services (private sector, NGOs); and the Gram Panchayat and Village Committees should ensure community participation and manage user contributions to capital and O&M costs
- Levels of service should, if possible, be in accordance with user preferences and expressed demands
- For externally aided projects, the following elements should be adhered to:
  - Adoption of a demand driven approach
  - People's participation through a decision-making role in the choice of key design and management arrangements
  - 10% capital cost share and 100% share of O&M costs by users

Based upon this background of policy history and change, and the thoughts of some key WATSAN actors, the KaR research aimed to

investigate some specific projects, to see if common lessons could be learned from them and the policy contexts in which they were operating.

F1.2 CASE STUDY PROJECTS

F1.2.1 The World Bank Swajal Project, Utttar Pradesh, India.

The Swajal Rural Water Supply and Sanitation Project is an oft-cited story of World Bank success with regards to rural water supply and sanitation in India. It is a US$63 million project covering about 1,200 villages in 19 districts in the Hill and Bundelkhand regions of Uttar Pradesh. It is a six-year project lasting from 1996–2002. Central to the project's design have been two major policies:

- Partial capital cost recovery (10%, with upfront cash contributions varying from 1% to 5%); 100% operation and maintenance cost recovery (i.e., costs of operations and costs of capital maintenance charges) from user communities; and about 60% cost sharing for individual latrines.

- The creation of an alternative service delivery mechanism for rural water supply and sanitation, involving a partnership between the village water and sanitation committee, NGOs and a Project Management Unit (PMU), in the form of a tripartiate agreement. The PMU is an autonomous entity at state level, which coordinates the allocation and spend of the project's finances, transferring funds to community managed bank accounts. The village procures goods and services with the assistance of the NGO who act as a support organisation. The Village Water and Sanitation Committee is legally empowered to manage these funds and to operate and maintain the systems built.

The Swajal project has undoubtedly been very influential in India's rural water supply sector. The cost recovery objectives it set are now part of key recommendations for India's national water supply policy (see above). The use of the community contracting system too, has been successful, with the supply chain for goods and services coming almost entirely from the local or regional private sector and with village councils having much more control over procurement, design and spend. Training villagers in contracting and project management has also been extremely useful.

However, there may be doubts as to the ultimate replicability of the project, both financially (should every state in India receive US$63 million?) and institutionally (does every successful project of this nature need an independent PMU set up at state level? How will the PMU re-

integrate with the existing state level water supply agencies at project close?). Furthermore, it is worth emphasising that the Swajal project is not cost recovering – replacement or expansion costs are not part of the user payments, neither are 90% of the original capital cost of the intervention. It will be interesting to return to project schemes in Swajal in ten years or so to observe the financial and institutional sustainability of the interventions, which the project has supported.

F.1.2.2 Village Level Water Supply Schemes in Olevanna, Kerela.

Olevanna is a Gram Panchayat (GP) with twenty wards located on the eastern side of Calicut, a city in Kerela State, southern India. Olevanna is one of six GP's in Kozhikode Community Development Block in North Kerela. The Olevanna GP covers 21.5 km^2, with a total population of about 50,000 people or 10,100 households (as of 1998).

The population of Olevanna has historically suffered acute scarcity and unreliability in their rural water supplies. There is plenty of water around, but it is saline and during the summer months there is often a shortage of potable water. With few or erratic official schemes in the area, households would tend to collect water from streams or wells between 200-1000 meters away. This could take up to 5 hours a day and result in just 100 litres per household per day.

The scarcity problem was particularly acute in the drought of 1985. At that time there was just one state run Kerela Water Authority (KWA) scheme providing an erratic water supply to 1,600 households. Burdensome coping strategies to obtain water from other means were often employed (see *Box 1.3*). The GP, therefore, came under extreme pressure from the population to resolve this problem. In 1987 the GP commissioned the first piped water scheme in Vettuvedankunnu Ward. This consisted of an intake well, an overhead tank and pipelines to distribute water through public stand-posts. It served 400 households and was funded by State Government grants to the Block Panchayat.

Despite the popularity of this scheme, however, the state budget constraints, which both the KWA and the GP faced, were stringent and they were discussed in length with the population in the GP. Villagers realised that local solutions to funding would have to be found if more of these schemes were to be developed. One village member decided to collect money from his neighbours, with a view to installing a small 1 HP pump and an intake well to service five households in the hamlet of Kamniliparamba. This self-financed scheme worked well.

With the success of this scheme, and the continued support of the GP, 54 other households in Kamniliparamba Ward got together to meet their own

water supply needs. They formed a registered co-operative society to organise their finances and make their operations official. From this beginning a network of privately run water supply schemes in Olevanna grew. Between 1987 and 1995, 26 such privately registered schemes arose across the Olevanna GP. In general, each household per scheme put in between 4,500- 12,000 rupees for the capital costs of the scheme and then paid 5-10 rupees per month for O&M costs.

The GP played a facilitatory and regulatory role in this process, rather than acting as a supplier. At first it spent its efforts convincing other groups of households that these schemes could work (each new scheme was launched with support of the GP in a festival manner to create a sense of occasion and ownership). The GP also provided a review and audit procedure for each co-operative's accounts, and it developed some rules of supply – limiting supply to 400 litres a day and encouraging water meter installation to ensure these limits were adhered to, or that extra costs for the additional supply (20 rupees per 1,000 litres) were paid.

A key issue highlighted by the GP has been the changing role of the KWA. From 1987 – 1995 the Olevanna schemes worked despite of, rather than because of, the KWA. The official state water supplier was not helpful in the early days, as the schemes offered a threat to the KWA's own duties and reason for being. However, since the decentralisation process for water supply and sanitation began in earnest in Kerela in 1995, the KWA have been much more supportive. Indeed, the KWA has now accepted the Olevanna model as a legitimate and successful approach, but only as a result of a statewide policy change.

Since 1995 a further 34 schemes have been created in Olevanna GP (which means a total of about 10,000 households now benefit from these private schemes), but with the decentralisation policy the approach has changed slightly. Now, the GP can provide 50% of the capital cost of the scheme and uses this if required to help with payments, for instance if the households cannot pay the full 100% of capital costs. User charges have increased to 30-40 rupees per month (maximum of 50 in one scheme), due to increased electricity costs for pumping. And many schemes are now operating at a surplus (see *Box 1.3*).

Box 0.3 ***The monthly operating budget for October 2001 for one scheme in Olevanna***

This particular scheme was set up in 1997 and covers 643 households, with 25 more joining in October 2001; the budget forms part of the monthly report to the GP.

Income:

25 new connections – 91,520 rupees
Monthly tariff (25 rupees per household) 16,700
Previous balance – 1,693 rupees
Total income – 109, 913 rupees

Expenditure

To reconstruct a well – 40, 354
To replace a pipe – 8,805
To repair pipes – 8,458
Salary to the scheme operator/ caretaker – 9,900
Electricity charges – 11,993

Total expenditure – 79, 510
Operating Surplus for October - 30, 403 rupees

However, there are some potential problems. Despite operational surpluses, no money is formally set aside for depreciation or expansion costs, though the GP thinks this would be perfectly possible if training in financial planning and accountancy were provided to the users. Also, these surpluses tend to sit in co-operative society accounts and are not considered as useful sources of finance for other investments, scheme expansion or community loans within the GP. Finally, there are problems with groundwater depletion, and the GP is looking for help (and legitimacy) to introduce demand management instruments and other forms of rainwater harvesting techniques to the schemes.

Nevertheless the Olevanna schemes are extremely interesting in so far as they show that full cost recovery can be achieved in peri-urban areas (with reasonable levels of poverty) for water supply systems. People did pay the full cost, relying on little external help. Furthermore, these schemes have included effective metering and volumetric-based charges and, importantly, have involved an institution that used to be responsible for supplying water, re-emerging as an effective facilitator and regulator of the system. Importantly too, the official water supply agency was not a supporter of the system until a policy change toward decentralisation took place, which legitimised the existence of the schemes in the eyes of the state water supplier.

F1.2.3 The Kerela Rural Water Supply and Environmental Sanitation Project (KRWSESP) – Implementation within the Kunnummel Panchayat

The Overall Project

The KRWSESP is a US$80 million project, supported by an IBRD loan of US$60 million, with the balance financed by beneficiaries (US$8 million), the GP's (US$6.5 million) and the Government of Kerela (GoK) (US$5.5 million).

The project will provide WATSAN in four districts in Kerela – Thrissur, Palakkad, Malappuram and Kozhikode. About 80 GPs from these districts, out of a potential 358 have been identified for project implementation via a number of criteria including levels of need and poverty, as well as a local capacity to implement. A limit of 30,000,000 rupees per GP is set. Within each GP, there will be about 25 beneficiary groups.

The flow of funds is as follows. The Government of India provides the IBRD finance to the GoK in the form of additional central assistance. The GoK authorises the KWA to draw new funds for the project through a separate bank account. These funds are passed on to District PMUs (DPMUs) operating at the districts. Funds from the DPMU, the GP and the beneficiaries then flow into the same bank account, to support each scheme within the district.

Overall the KRWSESP is expected to directly benefit about 1.5 million people or 5% of the state population. It is said that the project emerged after a World Bank team leader had visited the Olevanna Schemes.

Key benefits and costs of the project were identified in the World Bank's *ex ante* cost benefit analyses. The benefits were estimated to be as follows.

- Timesavings in water collection, averaging 1.3 hours per day, especially for women. Time savings were valued using a wage rate of 57 rupees per day;

- Incremental water consumption of 6 litres pcpd valued at the average of current and future costs of water supply;

- Savings from avoiding recurring costs required to maintain the present water supply arrangements (boiling, storage etc); and

- A salvage value of 5% at the end of the 20-year life of the scheme.

The key costs of the project (in constant 2000 prices net of taxes) were identified as follows:

- A (weighted average) capital cost of water supply of 6930 rupees per household plus 1,500 rupees per domestic connection for 70% of the households via co-financing and 4,000 rupees for 20% of the households to co-finance a latrine;

- Annual O&M costs per household (weighted average) of 180 rupees;

- Watershed development costs, taken as 10% of the WSS costs (690 rupees per household);

- Software costs estimated at 1070 rupees per household; and

- Institutional strengthening costs (including capacity building, project management etc) estimated as 2,080 rupees per household.

Consequently, the estimated rate of return (ERR) was estimated to be 25% for the whole project. This ERR, of course, understated the benefits relating to improved health, environment and community/ institutional strengthening activities. Sensitivity analyses suggested that the project could sustain a 12% ERR, despite substantial increases in costs and/or decreases in benefits; and a 50% reduction in estimated time savings.

In cost recovery terms, the conception developed by the World Bank was that 15% of the capital cost of each scheme was to be paid by the beneficiaries (of which at least 7.5% of payment must be in cash). The beneficiaries should meet 100% of the schemes O&M costs - about 180 rupees a year on average.

Kunnummel Panchayat

In order to look at implementation of the KRWSESP at GP level, a visit was made to the Kunnummel Panchayat, with the head of the DPMU for the District. Kunnummel Panchayat is known for successfully implementing the 73rd Amendment decentralisation principles and as such is a GP where the KRWSESP should be working reasonably well.

Kunnummel Panchayat has 10 Wards and a total population of 17,365. This translates into 3,868 households, of which 35% are below the rural poverty line of 18,000 rupees per household per annum. In terms of water supply, there are currently 2,820 private wells, 20 public wells, 4 borewells in the GP, but just 868 official KWA standposts and 70 KWA private connections. The Panchayat has created another 6 WS schemes and 14 public stand posts. There are 42 ponds from which people also draw their water. However, 3679 households (95%) have sanitary latrines.

The project is covering 970 out of the 3868 households in the GP across 9 of the 10 wards. There are 27 beneficiary groups in total, with about 36 households per group. Each group has a proposal for household latrines, schemes under drainage, waste disposal and women's development initiatives including micro-enterprises. For the water supply component, the project will aim for 70 litres pp pd, 8 hours pumping pd, with a 4 hour am and a 4 hour pm slot to pump water.

For the environmental sanitation programme, low-cost latrines are envisaged for those households below the poverty line only, and these households are expected to meet additional costs over and above the 2,000 rupees provided by the Project.

As per the project design the Kunnummel Panchayat will contribute 10% of the capital costs of the project, the beneficiary's will contribute 15% (7.5% in cash and up to 7.5% in kind) and the remainder will come via the GoK (5%) and the DPMU for the project (70%).

NASRAD, a local NGO is the support organisation for the project within this District and will help the DPMU to provide community facilitation and participation expertise.

Design and Implementation Strategy

Within Kunnummel Panchayat, the local design and implementation strategy has been as follows:

- A feasibility study undertakes a review of existing water sources, sanitation and environmental conditions in the GP. This follows various community meetings, which identify water scarcity problems.

- The WATSAN priorities within key wards in the GP are then short-listed.

- Via more formal group meetings in each of the short-listed Wards, the possibilities for project assistance are outlined and the potential roles of the different stakeholders are explained to the communities, including their role and responsibilities. If communities are interested in participating further, they are asked to form themselves into informal beneficiary committees and nominate representatives.

- These informal beneficiary committees then apply to the Panchayat for formal recognition of their group (this recognition states their location, the number of households in the group, and a statement of their willingness to participate in the project).

- Following this formal recognition, steps are taken for the formal election of an executive committee for the Group and for subsequent formalisation under relevant byelaws, etc., of the application fees, monthly subscriptions and so on. Bank accounts for the Beneficiary Group are established and the first 7.5% down payment are then collected from the Group members in three instalments.

- Following a more focused socio-economic baseline survey of the Group and identification and negotiation over uses of potential water sources for the Group's scheme, a technical team undertakes the formal design survey. Further negotiations have often been required between the Beneficiary Group and various landowners, whose wells or areas of land are required. The purchase of this land is organised, with the costs being added to the capital costs of the project.

- A community planning meeting then makes decisions over the construction based on all the data, and final estimates of cost and a community action plan for implementation are drawn up. At the planning meetings the technical options for the group are discussed (including price). These have generally taken the following shape:

  - Bore hole – 300,000 rupees
  - Open well – 350-400000 rupees
  - House connection – 3000 rupees (a pipe running from the main pipe for a maximum of 10m towards the beneficiaries' house).
  - Public Tap – 1500 rupees

  (So far, 26 out of 27 Beneficiary Groups have selected the open well and house connection option).

- Following this process there is a detailed engineering study and a finalisation of costs – both capital (including purchase of land for the well, which can range from 5,000 to 25,000 rupees for up to 40m^2) and recurrent, including replacement, costs (recurrent costs usually come in around 45 rupees per hh pm).

- The 7.5% cash contribution from the Beneficiary Group is then asked for (labour rates are calculated on local digging costs). The DPMU provide 40% of their contribution.

- Following audits and costs revisions during the construction process, the subsequent disbursement amounts required from the DPMU, the GP and the community are adjusted and then made (to avoid delay the Project provides the GP's 10% contribution, and then looks for the GP's contribution to be met in other ways). Throughout implementation

there are QC checks, monitoring and evaluation on the scheme finances and works.

- Operation and maintenance costs are collected from the Beneficiary Group, averaging up to 1.5 rupees per hh pd.

Observations

Thus far into the project, and at a DPMU level, there are a number of observations about the KRWSESP:

- The DPMU thinks beneficiary groups can pay a lot more towards the capital cost of the schemes than the 15% they are currently asked for.

- The design of the networks maybe a little top heavy – people may want more than 10m of pipe towards their house or more than 70 litres pp pd for more than 4 hours a day and be willing to pay for it, but they cannot.

- The project has a top-heavy institutional network of PMU and DPMU's, rather than locally organised institutions disbursing funds.

- The DPMUs are still deliverers rather than facilitators/regulators of water supply and sanitation services. The facilitation role is falling mainly to the local support organisation, NASRAD.

- NASRAD is used to provide the (neutral) community participation and negotiation skills the KWSA and the GP does not have.

- The project is expensive - US$ 72 million – and not necessarily replicable without another loan to the PMU, given the low level of beneficiary contribution required. The payback of the loan for the project by the GoK is another issue that may question the reliability of the project. Comparing the cost: benefit ratio of Olevanna and KRWSESP for its recipients (and for the state government) would be interesting.

F1.2.4 The DFID Supported Andhra Pradesh Urban Services for the Poor Project (APUSP)

The Municipal Administration & Urban Development, Government of Andhra Pradesh (AP), is working in partnership with DFID to assist poor communities in 32 towns of Andhra Pradesh. The project is called the Andhra Pradesh Urban Services for the Poor (APUSP). It will last from 2000 to 2007. The towns the project focuses on are between 100,000 and

1 million in population and hence have a reasonable degree of peri-urban, or slum, related issues to tackle, especially in relation to water and sanitation services.

Project assistance by the UK government is £94.4 million. The entire assistance is a grant to Government of AP. About 71% of the assistance from DFID will be in form of financial aid for services, and 29% is Technical Assistance such as training for councillors, officials, civil society organisations and communities to improve the performance of the Municipalities to deliver and maintain the services, which poor people need. APUSP comprises three linked and complementary components.

- Component 1 (£15.7 million) focuses on municipal reform. This means strengthening of municipal finances, improved financial planning and municipal accounting, staff training, improved operation and maintenance (O&M) practices, as well as more effective planning. Municipalities will prepare Municipal Action Plans for Poverty Reduction (MAPPs).

- Component 2 (£12.6 million or Rs.525) provides improved environmental services including water supply, sanitation, solid waste management, drainage, roads/footpaths and street lighting for slums.

- Component 3 (£12.6 million) works with community-based organisations in order to improve understanding of the needs of the poor, municipal decision-making and advocacy for improved services. It will also provide grants for small community projects through a new Urban Initiatives Fund.

To administer the project, two new units have been established in the State Government Department of Municipal Administration & Urban Development (MAUD) - the Municipal Strengthening Unit (MSU) and the Appraisal and Monitoring Unit (AMU). MSU supports municipalities and provides assistance in and arranges their access to funds. AMU appraises the MAPPs and monitors their implementation. The AP Urban Finance and Infrastructure Development Corporation (APUFIDC) will channel project funding to the municipalities

The two units and the international consultancy team, which provides technical assistance to these units and the project in general, are working very closely with state policy makers on urban infrastructure for those towns. As a result, they experience at first hand the difficulties decision makers have in decentralising revenues or raising tariffs for municipal services such as water supplies and sanitation, particularly when state funds are scarce.

An Improved Water Supply Report for the project indicated that:

- Water supply is a key sector in AP.
- The objective should be on short-term physical improvement to the networks.
- Limited improvements are possible, but the focus should initially be on non-technical aspects (for example the fact that 60-70% of water is delivered free).
- Other issues to focus on should include improved management, increasing revenue and reducing losses, training and public awareness, and more community and private sector involvement.

An improved Operation and Maintenance report for the project (not just for WATSAN) showed that:

- Overall, delivery on O&M is a major deficiency.
- The underlying reasons included a lack of political awareness, insufficient funds, ineffective management, poor planning, decision-making and use of limited resources, and a skills deficit.
- There is a growing awareness at both State and local levels that changes in O&M approaches are necessary.
- The way forward is seen as improved private and community sector participation and capacity building.

In relation to WATSAN, the project's main focus for cost recovery is on collecting people's dues on water supply tariffs, rather than on working to design and set a correct level of the tariff. This is because:

- There is a feeling that people can only pay up to 3% of their income on a water/wastewater tariff.

- It is felt that bigger gains can be made on reducing the supply costs of water/wastewater services (especially in relation to energy) than on increasing revenue.

In short, the project developers feel it will be difficult to charge people much more than currently charged for these services, but it is possible to collect much more of what is owed and supply the services more cheaply, hence improving the financial sustainability of the schemes it helps to implement.

Using the MAPP approach for designing its municipal projects, APUSP can provide seed corn money for connection charges to water in main urban areas, for instance, and seed corn money for network development in the slum areas.

The project adopts a process-based approach and so did not have any fixed ideas about reasonable levels of cost recovery to aim for at the outset. Instead, the aim has been to make the Municipalities more aware of the recurrent costs of their WATSAN services, what is new build, and how best to both reduce the O&M costs and sustainably fund them. With regards to O&M charges, the project follows state tariffs for water supply, which were only 30-40 rupees per month, but have been increased to 60. The project would like to see them increased to 70. At present, slum dwellers are obliged to pay only 50% of the tariff.

Observations

Thus far into the project, there are a number of observations about the APUSP:

- This project again relies on a PMU approach at state level to oversee a large budgetary transfer – in this case close to US$134 million. With state governments in fiscal crisis, it can be difficult for the project team to argue for long-term changes in policies to promote further cost recovery when they are holding the purse strings to such a large amount of funds and potential subsidy.

- The project is expensive - US$134 million – and not necessarily replicable without another loan to the PMU for other cities in the state, or other Class 1 cities in other states, given the low level of beneficiary contributions required.

- Assumptions are being made about the levels of affordability of the poor and hence cost recovery. Most project focus is on reducing supply costs, collecting dues and setting limits to options based on a judgement of what is affordable, rather than looking to find (financial and institutional) ways of helping people to pay more for what they really want.

- Useful recommendations are being developed about the need for private and community sector participation in service delivery.

F1.2.5 The Urban Slums Health and Sanitation Improvement Programme, Tiruchirappalli, Tamil Nadu, India.

This project involved the Tiruchirappalli Corporation, the Tiruchirappalli District Administration, Water Aid India and three local NGOs - GRAMALAYA, SCOPE and SEVAI - as implementing agencies.

Tiruchirappalli City is in the heart of Tamil Nadu, southern India and has a population of 668,000. The city has 155 slum areas containing about 115,000 people. Gramalya NGO, which was the target of the KaR visit with Water Aid, works in 8 slums in the East of the city. Under the Programme, it was proposed to construct, *inter alia*, pour flush water seal community latrines by demolishing the existing, state supplied, dry earth community latrines, in each of the 8 slums. For maintenance of these new assets, women members of self help groups from the respective slums set up SHE teams (Sanitation and Hygiene Education teams).

The Municipal Water Corporation had originally built community latrines in the slums in the mid 1980's, but these latrines fell into in a state of decay and had been totally abandoned by local residents. Drainage pipes were broken and the sceptic tanks were damaged. This had meant that people were defecating in, around and nearby to the latrines and their environs, rather than using them as they had been meant. Defecation on the banks of the local river also took place.

The key problem was a lack of a sense of ownership over the latrine blocks. The blocks had been built by the state, but were not properly maintained, cleaned or repaired. Local people felt no sense of ownership and the infrastructure fell into decay. There was little interest in the construction of new community latrine blocks as people felt the same thing would happen again in time.

Gramalaya sat with local Women's Self Help Groups from within these slum areas and discussed possibilities. Could a new sanitation block be constructed? Was there a need for one? If so how could it best be run in the long term? There was a clear local need for improved sanitation and washing facilities in each neighbourhood and there was plenty of thought as to how such a facility could be managed.

One group came up with the idea of paying to use the toilet – 25 paisa per visit to keep it clean. Once the purchase of cleaning materials and the wages for cleaners, and a watchman cum ticket issuer were incorporated, this was raised to 50 paisa per visit.

Water Aid provided Gramalya with a grant of 380,000 rupees to build the latrine block, usually consisting of spaces for 10 ladies; 10 men and a child friendly toilet block for those less than 6 years old. The blocks were connected to soak pits, which need to be emptied on a regular basis (if no soak pits were present Water Aid provided a grant for a further 160,000 rupees to construct them). With local inputs for labour coordinated by the SHE teams, the site was decorated and finished in an attractive fashion. The charging system was then introduced in one scheme, the first of its kind. Some in the community were against the idea at first.

The SHE team looks after the upkeep and maintenance of the community toilet block constructed in their slum. Every user is issued a 50 paise token allowing him/ her to use the toilet. A woman from the self-help group collects the money from the paid ticket issuer and closes the account every 12 hours. The accounts (a ledger) contain details on the number of users and money collected. During nights a watchman cum ticket issuer is appointed.

An average of 300-600 people use each community toilet every 24 hours, totalling 150-300 rupees a day. People prefer to pay their 50 paise and use the pay and use toilet blocks because they are reliably secure and clean, compared to other Municipal Corporation blocks or other options available for defecation.

The first pay and use latrine, collected 168,500 rupees gross over the past 16 months. *Table 1.1* charts the performance of the five schemes as of 30.09.01

Table1.1 Income and expenditure relating to pay and use community toilets

Name of Slum	**Total number of seats**	**Total number of users**	**Total Income (Rs)**	**Total Expenditure (Rs)**	**Expenses on other community development Activities**	
	Men	Women				
Karuvattupettai	10	10	307,762	153,881	33,050	120,831
Viragupettai	20*	10	229,700	114,850	19,750	95,100
Kamala Nehru Nagar	10		55,620	27,810	15,900	11,910
Kalmandhai	18*	10	318,900	159,450	49,650	109,800
Kalpalayam	11*	27	17,000	8,500	1,900	6,600
TOTAL	69	57	928,982	464,491	120,250	344,241

**denotes toilets renovated out of profit from the pay and use system*

Box 0.4 ***Income and expenditures for one particular pay and use system up to end September 2001***

Income and expenditures for one particular pay and use system up to end September 2001.

Income

Averaged 9,965 per month over past 16 months

Total: 159,450 rupees

Toilet related expenditure to date

Cleaners – 11,200 (700 rupees per month)
Cleaning materials – 12,000 (750 rupees per month)
Token issuer/ caretakers – 33,000 (2,060 rupees per month)
Token shed - 6,000 (lump sum)

Total: 62,200 rupees

Expenditure from savings to date

Community hall - gained a loan of 10,470 rupees to pay for 50% of costs, based on the income from the toilets. Paid for other 50% of costs out of toilet income.
Drainage channels - 10,000
Extension of corporation pipeline and water tank – 3,000
Garbage collection – 1,500
Well digging and motor pump – 27,000
Loan of 5,000 rupees to neighbouring slum group at 12% interest p.a – received back 5,500 rupees

Total: 51,470 rupees

Surplus in bank after 16 months: 45,700 rupees

The money collected is deposited in a Bank Account under the SHE team's name each week. At the end of every month the SHE-team and the particular Women's self help group from that slum convene a meeting and detail to members the income and expenditure for a particular community toilet. The balance, after meeting various expenses such as salaries and purchases of cleaning materials is kept in the bank account. The amount saved each month is pooled as a common fund for that particular slum towards health and sanitation related promotional activities including extension of street taps, construction for community halls, renovation of other damaged community toilets, construction of domestic drains, rubbish bins and provision of street lights.

Future investments from the toilets include plans for bathroom facilities, a urinal complex, a sewing machine centre and other investments depending on needs. As the knowledge of these latrines has spread, loans have been made from the surplus and advice given to other slum communities to help construct their own pay as you go latrines.

A visitor's book for the toilet blocks has recorded the impressions of state level decision makers and WATSAN decision-makers from elsewhere, such as Chennai. However, without an official policy change at State level, the local Municipal Corporation tasked with providing WATSAN services in the slums won't approve or promote the pay as you use system.

Observations

- The pay and use latrines are being utilised by very poor slum dwellers
- The first schemes relied on 100% subsidy for the capital cost.
- The schemes are more than 100% cost recovering recurrent costs.
- The capital cost could be paid back over a number of years. However, the surpluses these schemes have built up as a result, are instead being used to help wider WATSAN developments in the neighbourhood, or as loans to part-pay for other slum self help groups to renovate their systems. As the schemes are starting to self-replicate, less and less grant funding will be required over time. Is this a more efficient way of paying back capital costs, in terms of the outputs it creates?
- No PMU is involved – a local NGO is the implementing agency. An INGO coordinates the QC of the NGO's delivery.
- With more financial training and co-financing from other sources, the impact of these schemes is growing.
- The "seeing is believing" impact of these schemes is strong, both within and beyond the slum communities. However, policy changes are required to allow the State supplier of WATSAN to also "buy into" this approach to service delivery.

F1.2.6 Scope/ Water Aid Rural Water and Sanitation Programme, Tamil Nadu

SCOPE – A rural NGO partner for Water Aid

Scope is an NGO based in Tamil Nadu, formed in 1986. It operates in just one rural block in Tamil Nadu and in some of the urban areas of Tiruchirappalli. In the rural areas, SCOPE works independently, but with the support of the local block development office.

SCOPE focuses on the conservation and best use of water supplies and was an early local partner of Water Aid India. SCOPE is currently the Water Net Convenor for some 36 NGOS working on WATSAN issues across Tamil Nadu. However, since its formation, SCOPE has also branched out into rural production centres and savings schemes, supporting micro enterprises and businesses for rural people.

SCOPE has received funding and support from organisations such as the Netherlands Embassy through their Sanitation Partnership, Lutheran World Relief (Canada); Christian Aid, UNICEF, Solidarite Francais and a range of other international agencies and NGOs. However, SCOPE gets 60% of its funds from local government in Tamil Nadu (the social welfare board, the small wasteland development board and the forestry board). In 1987 SCOPE had a 30,000-rupee budget; it had in excess of 10 million rupees for FY 00/01, all of which was targeted on promoting self-sustaining, not for profit activities for local beneficiaries.

Water Aid has given SCOPE 600,000 rupees per year for the past 5 or 6 years to assist with their rural programme. As a result, Water Aid can monitor SCOPE's activities. In terms of the WATSAN issue in rural areas, SCOPE recognises that NGOs are a "drop in the ocean", but seeks to obtain replication and uptake of its successes on an equal partner basis with the Tamil Nadu Water Authority.

A key achievement of the SCOPE- Water Aid partnership has been to encourage the first village in Tamil Nadu (and possibly the country) to develop 100% sanitation coverage for themselves.

Kattukulam Village, Tamil Nadu – A Successful Rural Sanitation Scheme

Kattukulam village in Tamil Nadu is a typical southern Indian village in a very rural area. It has 110 households, or about 612 people, 90% of who are below the rural poverty line of 18,000 rupees per household per year.

SCOPE and Water Aid started work in Kattukulam in 1996. Their first participatory surveys of the village found that diarrhoea was a key issue, especially among women and the young. People were spending up to 2000 rupees a year on travel and medicine costs on the condition (the nearest town with a clinic is about 40 kilometres away). There was also just one pump and bore-well, and one water tank built by the state rural water supplier in the village. Water supplies were intermittent, available in the morning and evenings only. To obtain reliable water supplies, women were rising early in the morning (3 am or so, in order to avoid queues) and spending up to 2 hours a day travelling over a kilometre to draw water from a 70 foot well by rope. Only about 15 litres of water were obtained each trip.

SCOPE responded to the key demand of the community in Kattukulam for water supply first, and drilled three new tube-wells in 1996, 1997 and 1999, installing one hand-pump on each. These cost 24,000, 27,000 and 30,000 rupees respectively, and the community were asked for a cash contribution of 10% in each case.

For operating and maintaining the 3 tube-wells, each household was asked to pay 2 rupees per month. Hence 220 rupees per month were collected (2,640 per year). A surplus was built up (O&M costs were low – 60 rupees a year - and replacement/ extension costs – a new set of piping – cost 3,900 rupees and have only occurred once).

At the same time as the first tube well, SCOPE also set up self-help and savings groups for women – 4 women's groups of 20 members. 25,000 rupees were put into each group by SCOPE to kick them off. Each member

paid 25 rupees a month as savings into the group and 2 rupees subscriptions. Then, on a revolving basis, women could draw loans from the fund at a 2% interest rate per month (24% per year). Prior to this, moneylenders were asking for 10% interest per month. From 1996 – 2001, the women's savings groups have increased in the village to each hold about 70,000 rupees. Two men's savings groups of 14 and 28 members were started in 1997 and these now have about 98,000 rupees in them.

With regards to latrines, however, the community remained unconvinced at the project start. SCOPE asked the village leaders to put forward ten households to be involved in the construction of ten "model" toilets. The setting up of the savings groups and the drilling of the tube-well was conditional on this issue. No toilet volunteers, no other assistance. Ten volunteers were found.

Each volunteer was given a subsidy of 650 rupees per toilet to help build the latrine pit safely up to a plinth level (the total cost being up to 1500 rupees to build the whole toilet structure). There was also technical guidance to help build the superstructure, and the possibility of a 650 rupees loan from SCOPE to help build the structure if needed.

The toilets were constructed with a bathroom and attached to a kitchen garden in order to use the wastewater. Out of a range of standard designs, different people chose different toilets.

Once the first 10 were built, they became very popular, especially among the women, due to their convenience, and more households requested a latrine. By the end of 1996, SCOPE had helped to build 68 toilets for 96 families. By the end of 1997, every household had built a toilet.

SCOPE continued to offer loans of up to 650 rupees to those who could not afford to meet all of their construction contribution. With a 650 loan and a 650 subsidy, only 2000 rupees maximum would be required to build the latrine. 39 out of the 110 households took on these loans. The self-help groups also offered further financial assistance.

The income from the kitchen gardens helped to pay back the loan for the toilets, producing on average 30 –90 kgs of fruit and vegetables a year, net of personal consumption, which was sold in local markets for up to 400 rupees in total.

By 1997, 75-80% of the women in the village were using the toilets, and by 1998, 85% of women and up to 72% of the men were using the toilets. By 1999 these numbers expanded to nearly 100%.

In 1999 a follow up participatory survey found that no single case of diarrhoea had lasted longer than 2 days, and very few people were spending any time or money in the clinics. As a result the saved money was being spent on replacing roof tiles and buying more animals among other things.

By the end of 2001, sanitation uptake was occurring in up to 40 neighbouring villages, with people willing to pay, or take loans, for the full costs of the latrine. Households had seen the economic benefits the latrines were bringing to owners in Kattukulam, and were learning more from the discussions with SCOPE about these benefits. However, SCOPE continues to provide a subsidy on any new latrines, especially for the poorest, as they see the re-investment of any cost savings the latrine generates for the household as a better form of cost recovery. Self help groups also provide a range of financial assistance.

Importantly, SCOPE has also run sessions in hygiene awareness and education in parallel to the latrine building process. They have also installed a latrine mini-mart in a central location, selling all of the spare parts, building materials, soaps and disinfectants that latrine owners need, as well as being a source of advice to new latrine owners. The compound also displays the range of latrine models a household can choose from. Both the goods the shops sells and its staff have provided jobs for local rural people. Furthermore, each village is encouraged to take on and pay for a water and sanitation caretaker, from a scheduled (lower) caste. Although the wage is not significant, the strong role in the community, which this provides for these people, is often of great personal importance.

As households in these rural areas now complain much less about their water supply and sanitation services, the Tamil Nadu Water Authority is quite happy with SCOPE' s work. SCOPE and Water Aid, however, are keen to continue with the capacity building of the Authority so that in time these kinds of approaches become part and parcel of what the TNWA does.

Observations

- The latrines have been taken up by very poor rural households.
- The programme offers a 40% subsidy for the capital cost, and a further 40% loan for the poorest.
- The latrines have been marketed and designed to generate tangible economic and financial benefits (lower healthcare costs, kitchen gardens).

- The water supply scheme offered a 90% capital cost subsidy, but was priced to create a surplus from its operating charges to more than cover replacement and expansion costs.
- Community financing clubs were created in parallel.
- The first community has to be convinced, via a degree of conditionality, to invest in sanitation.
- A wider infrastructure of advice, education and materials has been created to support the uptake of latrines.
- Uptake of the latrines is taking place organically – 100% cost recovery could be obtained, especially via community financing options.
- No PMU is involved – a local NGO is the implementing agency. An INGO coordinates the QC of the NGOs delivery.
- The "seeing is believing" impact of these schemes is strong, both within and beyond the rural communities. However, policy changes are required to allow the State supplier of WATSAN to also "buy into" this approach to service delivery and to allow the NGO to capacity build the state supplier to take on this kind of role.

F1.3 STAKEHOLDERS MET

A wide range of stakeholders was met, from both a policy and project perspective. These included the following:

F1.3.1 World Bank Water and Sanitation Programme, South Asia

- Salman Zaheer, Lead Utilities Specialist; szaheer@worldbank.org
- Vivek Srivastava, Country Team Leader (India); vsrivastava@worldbank.org
- Satyajit Singh, Rural Specialist; ssingh5@worldbank.org
- Michael Webster,Rural Development Specialist; mwebster@worldbank.org
- Junaid Ahmad, South Asia Programme Team Leader; jamad@worldbank.org

F1.3.2 DFID India

- Yusaf Samiullah, Senior Engineering and Environmental Adviser; Y-Samiullah@dfid.gov.uk
- P. Srinivasa Rao, Engineering Adviser; S-Rao@dfid.gov.uk
- Debashish Bhattarcharjee, Engineering Adviser; d-bhattarcharjee@dfid.gov.uk
- Gopi Menon, Deputy Programme Manager (APUSP); G-Menon@dfid.gov.uk
- Vijay Pillai, Economic Adviser; V-Pillai@dfid.gov.uk

- Radhika Sridhar, Programme Officer, AP Office Hyderabad; dfidi-hyd@dfid.gov.uk
- RS Sharat, DFID Representative, Andhra Pradesh; dfid-hyd@dfid.gov.uk

F1.3.3 DFID Andhra Pradesh Urban Services for the Poor (APUSP) Project Team

- Michael Whitbread, Municipal Governance Co-ordinator; m.whitbread@apusp.com
- John Crippen, Engineering Adviser; j.crippen@apusp.com
- G Subrahmanyam, Municipal Engineering Specialist; g.subramanayam@apusp.com

F1.3.4 The Olevanna Project, Calicut, Kerela

The current and previous Gram Panchayat project team (including the ex and current Presidents of the Gram Panchayat, and Ward representatives) and some recipient villagers.

F1.3.5 World Bank Kerela Rural Water Supply and Sanitation Project

- C Rajan, Project Manager, DPMU, Calicut dpmu_clt@satyam.net.in
- George Mathew, NGO local representative (NASRAD)

F1.3.6 Water Aid, Tamil Nadu

- Shunmuga Paramisivan, Country Representative, Water Aid India; waindia@satyam.net.in
- S Damodaran, Executive Director, Gramalaya (NGO Implementing Agency for Water Aid), Truchirapalli Urban Slums Health and Sanitation Improvement Programme
- Scope (NGO Implementing Agency for Water Aid) Kattukulum Rural Water Supply and Sanitation Project

F1.3.7 General

- Dr Ratna Reddy, Hyderabad University- An academic who has undertaken willingness to pay studies in water supply in India; ctvrr@sify.com
- Dr A J James, Independent Environmental Economics Consultant; ajjames@vsnl.net
- N K Narasimha Rao, Commissioner, Andhra Pradesh Academy of Rural Development; nkr@rediffmail.com

F1.4 SUMMARY

The following table summarises some of the key cost recovery information from the range of WATSAN projects we visited in India.

Table.4 Summary of Cost Recovery

Project	Beneficiary	Capital Cost	Amount & % Recovery O & M Cost	Replace Cost	Water Supply	Toilets Constructed	Size of Scheme	% Below BPL	Cost of getting water/ toilets before	Remarks
Olavanna. 1987-88 to 1997. Peri Urban.	Gram Panchayat 50,000 population ~ 10,000 HH Coverage 80%	100% 4500/- to 12000/- per HH	100% Rs.5/- to 10/- per month per HH	0%	400 lt per day per HH + More at a price	No	26 nos	24% (Rs. 22,000/- p.a. for Peri Urban areas)	3 to 5 hrs 200 spent to fetch 100 lpd water from more than 300 m distance. Cases of diahorreah prevalent.	No scope for PSP. Great Leadership. Crisis created start. Demonstration effect.
Olavanna. After 1997. Peri Urban.	Gram Panchayat 50,000 population ~ 10,000 HH Coverage 80%	50% by beneficiary	100% Rs. 30/- to 50/- p.m. per HH	0%	400 lt per day per HH + More at a price	No	60 Nos (Incl.26)	24% (Rs. 22,000/- p.a. for Peri Urban areas)	People selling gold for capital cost. No technical support from KWA. Difficult relationship between 1987-1997 with KWA. Convincing was difficult and required repeated meetings. Decisions taken by Executive Committee. High Literacy existed.	Meters installed. Penalties for overuse. Subsidies for functions such as marriage, etc. WRM is becoming an issue now. Festive mood and media for inauguration. Chlorination done.
KRWSA. (Kunnumel) GP - Water Supply. Rural.	3868 HH (Total) 970 HH (Beneficiary)	7.5% in cash and 7.50% in cash / kind. 10% by GP. 75% by KRWSA DPMU (Finance by WB project fund of $80 million)	100%. Rs.1.00 to 1.50 per day per HH	Included in the 0&M cost	70 lpcd	Yes. 3679 (Already existing)	27 Beneficiary Groups. 970 HH covered (25% fo total). 579/970 are BPL	35% (Total) (Rs. 18,000/- p.a. for Rural areas)	KWA scheme cost Rs. 22/ -p.m. per HH. It involved 3 to 4 hrs of walking to get < 70 lpcd.	Support Organisation is NASRAD. Pumping hrs = 4+4 hrs. Only 10 m pipeline is supplied under the scheme to each HH. Willingness to pay is Rs 1.50 p.m. per HH. Project conceived by W Bank after visiting Olavanna. Aim to build capacity of GP.
KRWSA. School sanitation program	School children	30% to be contributed by the school from their budget.	100%	100%	N/A				Poor sanitation facility before. Unhygienic condition. Health Impacts.	40 Self Help Groups created to help poor in financing capital costs. Costs: Rs 30,000 for bore wells; 35000/- to 40,000/- for open wells; 3,000/- for HH connections; and 1,500/- for public taps. 5% of the total project cost can be used for land purchase. Land cost varies between Rs. 10,000/- (hilly) to Rs. 25,000/- (good area) per cent (=40 sqm).

Project	Beneficiary	Capital Cost	Amount & % Recovery O & M Cost	Replace Cost	Water Supply	Toilets Constructed	Size of Scheme	% Below BPL	Cost of getting water/ toilets before	Remarks
KRWSA. Other sanitation program.	Objective is to convert deep pit latrines to 2 pit latrines for arresting GW contamination.	Beneficiary Contribution is Rs 3,470/- for new toilets. KRWSA Contribution is Rs 2,000/- for new toilets. KRWSA Contribution used to be Rs 500/- for toilets earlier.	100%	100%	N/A				Poor sanitation facility before. Unhygienic condition. Health Impacts.	DPMU says community can pay more. Under People's Planning Program (Decentralization) Community contribution is > 90%. Under Rajiv Gandhi National Drinking Water Mission comm. Contribution is >10%. No. regard to WRM. NGO's wants govt. to do WRM. High Literacy.
Women's Dev. Initiative (Microenterprises).	Women	Funding under WDI : 30% from beneficiaries per BG and 70% from KRWSA.								WDI (Microenterprises) gets Rs. 1500000/- out of allocated Rs. 30000000/- per Panchayat. Rs 1.0 million out of the Rs 1.5 million goes for starting the microenterprise. The balance Rs 0.5 million goes in training
APUSP (Urban)	32 Class I towns (100,000 to 1.0 million population)	0% for infrastructure provision except Rs 6,000/- as connection charges.	Cost recovered through tariff, tax, cess, etc. Rs 60/- per month per HH.	0%						Political reluctance for increased tariff. Government order stating slums should pay less than 50% of others. Process of community negotiators called MAPP on how to spend the grant money. Funds required for seed money as APUSP would reimburse the expenses incurred. Current tariff can meet only 40% to 50% of the 0&M costs. CR by reducing O&M cost and increasing collection revenues. Rule of thumb being used for setting tariff (2% to 3%).

Project	Beneficiary	Capital Cost	Amount & % Recovery O & M Cost	Replace Cost	Water Supply	Toilets Constructed	Size of Scheme	% Below BPL	Cost of getting water/ toilets before	Remarks
Water Aid Slums (Urban)	25 Slums in Tiruchirapalli (Urban) - 9 in north zone; 8 in east zone; and 8 in west zone.	0%. Rs 380,000/= borne by WaterAid + Labour provided by community + Rs 160,000/- borne by WaterAid where disposal system was not existing.	100%. (i) Use & Pay @ Rs 0.50 per use; (ii) Rs 50/- per HH p.m.; (iii) Interests from funds of SHG used for other projects @ high rate of interest PLUS Rs. 500 per quarter per community for cleaning of soakpits.	100%	No	Yes			Poor Sanitation facilities	Rs 4,000/- surplus p.m. for Pay + Go, used for wider development activities. Federation of Committees (FoC) at Panchayat level. Sanitation fund of Rs 100/- per HH. Rs 0.5 million to Rs 1.0 million collected by FoC per Panchayat. Sum total of all Panchayat is more than 0.5 million, which is being used for development works.
Scope + WaterAid Kattukulum (Water Supply). Rural.	110 HH. 612 people	Capital Cost of three borewells Rs 24,000/-, Rs 27,000/- and Rs.30,000/- respectively. Rs 2000/- contributed by beneficiaries for each borewell. Rest by Scope.	100%. Rs 2/- per month per HH covers all 3 Hand Pumps + caretaker + replacement of pipes.	Included in O&M costs.	150 lpd	N.A	100%	90% below R.P.L.	Before Water Supply was approximately 60 lpd. Collection time per day was over 2 hours. Distance of water source was more than 1 km and ropes, etc. was required for fetching 80 feet deep water. Women had to start at 03.00 am to 05.00 am for water.	Already each HH pays Rs 2/- p.m. (approx) for water tax, which is a past of house tax, for the unreliable government supply. Capital cost recovery is possible but NGOs believe in better utilisation is other development works. TWAD Board is very happy and so are the pump mechanics who have been trained.

Project	Beneficiary	Capital Cost	Amount & % Recovery O & M Cost	Replace Cost	Water Supply	Toilets Constructed	Size of Scheme	% Below BPL	Cost of getting water/ toilets before	Remarks
Scope + WaterAid Kattukulum (Sanitation).	110 HH. 612 people	Total Cost Rs 1,500/-. Rs 650/- borne by Scope. Rs 850/- by beneficiary. Interest free Loans of 650/- by Scope to be paid back in 10 equal Installments. 39 HH availed loans from Scope. Other HH availed loans from SHGs. New toilets coming up on their own now.	100% by beneficiary	100% by beneficiary		100% coverage	67 HH by 1996. 110 HH by 2001. With attached bathroom.	90% below rural BPL	PRA done in 1996 indicated Rs 1,500/- to Rs 2,000/- p.a. per HH was being spent on medication. This fact was ased as lever.	7 SHGs formed. Savings of Women SHG is Rs 71,000/-. Saving of Men SHG is Rs 98,000/-. Commitment shown by Scope by providing 1st borewell and handpump. Hygiene awareness programmes. Kitchen gardens - sold net of consumptin Rs 400/- pm for 3 months. High costs, inconvenience, time, illness now reversed. Sanitary Mart, etc. provided. No serious case of diahorreah. Men had a longer take up. WaterAid in general in rural area. GoI provides capital Cost for borewell. WaterAid encourages community through training to meet O&M costs.
Scope + WaterAid Kattukulum (Self Help Group - SHG).	7 SHGs formed that are listed hereunder:									
	1. Women SHG - 4 Nos X 20 members - 1996. 2. Men SHG - 2 nos (28+14 members) - 1997. 3. Elders SHG 4. Youth SHG 5. Mother SHG 6. Children SHG 7 Hand Pump Maintenance SHG	Rs. 2/= Subscription per month	Rs. 25/- saving p.m. Total Rs 71,000/- savings as on date. Rs. 15/- saving p.m. Total Rs 98,000/- savings as on date.							Disburses loans @ 2% p.m. as against 10% p.m. charged by local money lenders.

Annex G

Cost Recovery in Water and Sanitation Projects – Lessons from South Africa

G1 COST RECOVERY IN WATER AND SANITATION PROJECTS – LESSONS FROM SOUTH AFRICA

G1.1 INTRODUCTION: A CONSIDERABLE CHALLENGE

At the end of Apartheid, South Africa woke up with the considerable challenge of providing adequate water supply to 12 million people and adequate sanitation to 2l million people.[1] Among other major changes, municipalities had to be restructured, both physically and institutionally. The restructuring of water services was seen as a major step within this framework.

The first post-Apartheid government made provision of basic services to disadvantaged people one of its top priorities, particularly in rural areas and former townships. Since then, water has been a hotly debated issue in South Africa, and many NGOs and public sector organisations have been advocating a "free water" policy. The ANC made "free basic water" its official policy line in the 2000 local elections. However, the policy sits uncomfortably with the simultaneous drive for decentralisation and market liberalisation in service provision. Both of these objectives are in turn consistent with reversing a non-payment culture and improving rates of cost recovery. While the importance of the cost recovery message is not completely lost on DWAF, or on many consumers themselves, its implementation is now complicated in having to work around the current raft of sector reforms. These reforms, combined with other undertakings to redress past service discrimination do not create an ideal environment for drawing general lessons on what works for cost recovery. Accordingly, the model structures detailed here are of more interest for what they could potentially deliver rather than for actual recovery achievements.

Despite these inconsistencies, supply achievements have been impressive: 7 million people have been provided access to improved water services since 1994, at a cost of R4 billion. Also, considerable institutional reforms have taken place, toward more flexibility. But despite all of this, cost recovery has remained problematic, and all of the different institutional models that have emerged have faced constraints linked to non-payment. Hence, on the whole, the free basic water policy has limited the ability for programmes to pursue self-sufficiency. Still, there have been a few successful schemes, which are discussed in this Annex.

A further note: despite the broad policy decision that all of the population has a right to free basic sanitation, neither a definition 'free basic sanitation' nor a detailed policy framework has been developed. Often at the local level, one department or agency deals with WATSAN, and financial viability of one

[1] As stated in the White Paper on Water Policy, 1997. Internet: http://www.polity.org.za/html/govdocs/white_papers/water.html?rebookmark=1.

service may affect the other. The free basic water policy therefore may also have negative impacts on sanitation provision, a matter that local authorities will have to consider..

G1.2 INSTITUTIONAL REFORMS AND INSTITUTIONAL MODELS

This section will address the dramatic institutional reforms faced by South Africa in a very short time-span.

G1.2.1 Legal reforms of the water sector

During the Apartheid era, homelands managed their affairs independently from the rest of the country (institutionally and financially) and, as a result, a these areas was largely neglected, with poor or non-existent infrastructure. There was no common institutional framework for organising water services between black and white communities, and very little was known to the broader population about the state of infrastructure services in black areas. In 1994, a White Paper on Community Water Supply and Sanitation was published that set out key objectives for reform. Since then, key pieces of legislation affecting the water sector have been enacted to provide institutional, legal and regulatory frameworks to underpin the provision of water services.

In particular, the institutional reforms have had an objective to carry out a gradual process of decentralisation of water services delivery.

The Constitution of South Africa: the Constitution of South Africa brought a Bill of Rights, which includes the right of basic water supply to all South Africans (Section 27). The Constitution also allocates the responsibility and function for the provision of water supply and sanitation services to municipalities (Section 151) with National and Provincial governments being required to provide a supportive role. National government is also assigned the responsibility for developing norms and standards for service provision. In addition, National and provincial government can intervene in the event that Municipalities are unable to fulfil their constitutional obligations, however this intervention must be with the full participation of the municipalities so that their capacity to perform the functions can be developed in the process.

The ***Water Services Act (No. 108 of 1997)*** set out the common legislative framework for water services for all municipalities in South Africa. Together with the National Water Act of 1998, it replaced the Water Act of 1956, redefining the institutional roles and responsibilities and bringing the water services delivery framework in line with the Constitution and principles of local governance. With the new responsibilities of central government and the national Ministry for water, the Department of Water Affairs and Forestry (DWAF), were refocused to perform regulatory functions, while local governments were charged with defining methodologies for tariff-setting and service levels, and for monitoring water service activities of local

governments. District municipalities and the metropolitan municipalities (for larger cities) were granted responsibility as Water Service Authorities. Water Service Authorities are in charge of monitoring and regulating service provision by the Water Service Providers at a local level. Those Water Service Providers can be the Water Service Authority itself (in the case of direct management) or any other type of provider, including private sector or possibly, civil society organisation. The Water Service Authority would need to sign a contract with the provider in order to ensure adequate provision of those services (see *Section 1.3.3* of this Annex).

DWAF was assigned a regulatory role, while publicly-owned water boards were assigned the role of providing bulk water service to municipalities within their supply area. This new role was in sharp contrast to DWAF's role prior to the Act (and is still, due to the difficulties of carrying out the transition), which was closer to one of water service authority and provider, especially with the running of large supply schemes in rural areas.

In more detail, DWAF's main regulatory responsibilities are as follows.

- To set national norms and standards (and, in particular, minimum levels of service);
- To legislate with regard to municipal functions (including minimum procurement rules);
- To monitor performance;
- To set minimum reporting requirements;
- To set overall tariff policy; and
- To encourage regionalisation in order to achieve economies of scale.

Finally, DWAF is in charge of controlling water resources, and remains responsible for the management of a number of large rural water schemes.

The 1997 Act assigned the role of ***Water Services Authority*** (WSA) to local government, entrusting it with the responsibility of providing access to affordable, sustainable water services to all existing and potential consumers in their areas. According to the Act, WSA can act as service providers within their areas or enter into a water services contract with a service provider to perform these functions on its behalf, or enter into a joint-venture agreement to jointly perform this function, with the condition that it has to consider all the public providers capable of providing this function before entering into an agreement with a private provider[1]. Specifically, WSAs are in charge of the following.

- To balance the needs of stakeholders, in terms of granting abstraction and discharge licences.

[11] Note that these reforms essentially alter role of other stakeholders such as NGOs . In the new South African structure DWAF is the main conduit for funds that may formerly have been channelled through NGOs at specific projects. NGOs must now function and compete as service providers.

- To achieve the requirements for water service provision set by DWAF, and in particular, to set tariffs and determine levels of service at a local level.
- To enter into contracts with Water Service Providers (WSPs) best able to achieve these requirements and where such contracts are signed, to monitor the contract.
- To report to DWAF.

In addition, the Act defined the roles and responsibilities of ***Water Service Providers (WSP),*** water service intermediaries and water service committees. WSPs can be a public, private or mixed entity, or the municipal government itself. In practice, WSPs are divided between bulk supply providers and retail supply providers. Water Boards are usually 100% publicly owned: they produce and treat water which they then sell-on to municipalities. There are about 8 Water Boards providing this kind of services in the main urbanised areas of the country - in between, these services are under DWAF's responsibility.

G.1.2.2 Local government reform and impact on Water Services

Legislation affecting the structure of municipal government has had a substantial impact on the way water services are delivered.

The ***Municipal Structures Act (1998)*** and the ***Municipal Structures Amendment Act (2000)*** set up the basis for the establishment of municipal government, distinguishing between: Metropolitan Municipalities (Category A), Local Municipalities (Category B) and District Municipalities (Category C). It defined the way in which municipalities are established, the way councils are to function and the division of powers and functions between municipalities. The 2000 amendment assigned responsibility for the water service authority function to Category C municipalities (although Category B municipalities can be authorised to perform the WSA function by the Minister of Provincial and Local Government) and to Metropolitan Municipalities (Category A) in metropolitan areas (the largest cities, such as Durban, Johannesburg, Pretoria or Cape Town).

District municipalities are one level up from local municipalities in the sense that their area of responsibility may include more than one local municipality, particularly in rural areas. The objective of this reform was to minimise the risk of a situation whereby municipalities are too small to provide services in a competent manner. One issue with this reform, however, is that "district councils" do not have any real legitimacy or structures attached to them, and since there are relatively recent creations, and are more akin to just an "empty shell". This is a twofold problem, as their members are not directly elected and they also lack capacity and personnel. In addition, according to current arrangements, Category B municipalities (local municipalities) receive the equitable share from the central government, i.e., a nominal subsidy per person below the poverty threshold in the municipality's area, whereas category C municipalities (district) are responsible for the provision of water services. As a result, these funds cannot be directly allocated to the water

sector, and a number of problems with fund transfers, including timing and overall allocation, means that the water sector is lacking in necessary funds to develop as quickly as it should.

The new demarcation of municipal government boundaries has had a substantial impact on the organisation of water services. The water policy reform was initiated in order to eliminate the distortions inherited from the Apartheid regime, so that predominantly urban areas were made responsible for a vast rural hinterland, with a goal to facilitate de facto cross subsidisation, between wealthy centres and poorer hinterlands. Following a transitional change in demarcation, the permanent demarcation was done in December 2000, just prior to new local elections. However, the transition has yet to be completely carried out, due to both human and financial constraints. In terms of water service provision, this raises an enormous challenge for water service authorities, whose scope of services was considerably expanded to include areas with very low service and cost-recovery levels.

G1.2.3 Implications from the separation between WSA and WSP

The clear demarcation between Water Service Authority function (WSA) and Water Service Provider function (WSP) has introduced clearer responsibilities for water service management and can give rise to any type of permutations for performing water service provider functions. This research looked at many of these combinations to assess their merits in terms of service delivery and cost recovery potential.

Projects examined included:

Direct public provision: such as in Krugersdorp or Durban Metro. Direct provision is usually in the form of a ring-fenced municipal service. These entities are focussing on commercialisation as a way out of financial deadlock. However given the political climate in South Africa, it is unsure whether this will be allowed to occur.

Public-public: partnership: Rand Water through Odi retail in Winterveld;

Public-private partnership: Jowam in Johannesburg, where an international private operator (WSSA) signed a 4-year management contract with the municipal utility, recently separated from the municipal services.

Tri-sector partnership (with Durban BPD or particularly with the BoTT approach).

Community based models: Smaller scale stand-alone projects in partnership with NGO or engineering consulting firm inputs.

South Africans have been very creative at inventing new models for water service provision, including with private sector and the civil society sector, in either bilateral or tri-sector partnerships. They have also demonstrated a hasty

approach toward dumping these projects, on the basis of assumed failure. For example, the BoTT model (see below) has been recognised as a useful innovation in a crisis environment. Despite criticism of the cost of the BoTT approach, DWAF is currently developing its thinking about how to continue the BoTT process.. Various alternatives are being considered.

G1.3 COST RECOVERY

G1.3.1 Understanding of cost-recovery concepts

In South Africa, cost-recovery is usually understood as an indicator of revenue collection rather than an indicator of revenues as a percentage of incurred costs. This is largely a reflection of the particularly poor record of payment at national level.

Furthermore, two strands of payment culture are prevalent among consumers: a culture of non-payment and the non-payment culture. The former suggests that people do not pay because there is an historical habit of not paying for public services (such boycotts were seen as key during the Apartheid years). The latter suggests that people do not pay because they do not know why they should pay.

G1.3.2 Cost-recovery performance

The fluid institutional arrangements and varied interpretation of cost recovery means that it currently difficult to generalise about performance. Use of prepayment technologies and the increased use of private contractors to service these technologies and offering revenue collection functions can be foreseen.

However, the basic non-payment culture is prevalent for all service providers irrespective of location. For example, the issue of revenue collection being separated from operation and management functions was raised in several contexts.

In the case of Jowam in Johannesburg, only revenue collection from the largest customers has been transferred, and Jowam has no control over revenue collection of those who do not pay at present. In some community-based organisations, there is a similar problem. Under the new decentralised arrangements if the district municipality has control over fund management, these communities are obliged to channel funds upwards thereby depriving themselves of a very important management tool. Furthermore, many users, especially in rural areas, use much less than 25 litres per person per day, and so it seems uneconomical to bill and collect payments from these users.

G1.3.3 Subsidy arrangements

Given the very poor record at costrecovery, the water sector in South Africa has so far subsisted and developed thanks to the provision of subsidies from the central government.

National Subsidy Arrangements

The primary source of financing for local government remains local taxes and other revenues levied and collected by municipalities themselves. However, the national government provides part of the finance through the *equitable share grant*, which is an unconditional grant that goes direct from national government to the District Municipalities to be spent according to their budget priorities.

The allocation of the equitable share has risen rapidly in 2000/1 and is projected to increase further in 2003/4. The equitable share grant will eventually equate to about R20 per rural family per month, which is considered to be insufficient for the cost recovery of free water (see below on the free water policy). Local government will also receive conditional grant funding. The implications for local authorities of the increases in the equitable share will be a general increase of the average grant per poor household.

DWAF Operating Subsidies

At present substantial subsidies to the water sector are occurring through the support by national government of the operating costs of DWAF water supply schemes. These schemes are in the process of being transferred to local government. In general a re-allocation of the current operating subsidies should support a free basic water policy. At present these subsidies are not well targeted, however, and there are low levels of cost recovery in many of these schemes. There are even indications that since the free basic water scheme, cost recovery has declined.

Local Level Subsidies

The most important means of financing services at the local level remains locally raised revenue through cross-subsidisation. In the case of more populous municipalities with large urban cores, this system can work well, as the tariff can be adjusted upwards for those that use more than 6kl of water. However, in the more rural municipalities, the number of consumers who can be taxed with a higher levy is very small, therefore this system does not work in these areas. Ironically, the equitable share grant was mostly designed for these areas.

G1.3.4 Impact of politics: the Free Water Policy

Any cost-recovery story in South Africa should always be broken down to "before" and "after" the Free Basic Water Policy.

President Thabo Mbeki announced the free basic water policy in December 2000 as an essential aspect of poverty reduction in South Africa. But the initiative has been criticised in some sections of the WATSAN community. The policy is to provide 6000 litres of water per month to a household (estimated at 8 people) in accordance with the World Health Organisation basic level of water supply. The status of implementation of Free Basic Water by local authorities on 1 July 2001 (which was set as the deadline for implementation) revealed that approximately 23 million people were being served with Free Basic Water in about 50% of the district municipalities of South Africa.

A Free Basic Water Strategy Task Team, which was chaired by SALGA and including as members DWAF, DPLG, the National Treasury, the Mvula Trust, the Development Bank of South Africa, and the South African Association of Water Utilities was established to spearhead the 3-stage implementation programme. Free basic water is to be funded using a combination of the equitable share of revenue of local government (see above) and internal cross-subsidies from appropriately structured water tariffs in a manner that best reflects the specific situation in the respective local government area.

All municipalities with the infrastructure in place were expected to start implementing the free basic water policy from July 2001. However, it was recognised that some municipalities may not have the capacity to implement the policy to a full extent immediately. Therefore, it was recommended that policy implementation be approached by developing orders of strategy.

In theory, there might be potential advantages of the free basic water policy given that there are a few successful examples. In particular, Durban Water Metro (see case study below) claims that such policy is actually cheaper than paying for administrative costs to collect from low-volume and low-income users and higher income areas are able to subsidise the scheme. Indeed, whoever consumes more than $6m^3$ has to pay the full cost of its consumption. However, the situation in Durban is quite unique when compared to the rest of the country: the Metro is relatively industrial and has relatively affluent domestic customers, so that both categories can afford to cross-subsidise poor consumers. Quite apart from any practical advantage, the main advantage is also for politicians to increase their popularity. But such advantage is by far too short-term orientated, compared to the potential benefits that could be extracted from sustainable WATSAN projects over the long-term.

Indeed, in many other municipalities, the disadvantages of the free basic water policy are patently clear. They include:

- Dependency on external subsidy sources;
- Disempowerment of community structures;
- Devaluation of water, of which the economic value is completely lost;
- Potential squandering at the household level
- Destruction of assets through lack of ownership;
- Cost escalation of capital and maintenance through lack of cost recovery;

- Focus on subsidies to connected customers, with a lack of clarity about how network extensions are going to be funded; and
- No obvious way of ensuring those who use non-networked water services in remote rural areas can benefit from the FBW policy.

Some potential approaches to mitigate these problems include consumer education; a remit by the High Court for service providers to be able to take harsh action against defaulters and abusers of the FBW policy (the poor could be denied any water at all if they abuse the service); and overall network extension planning to be undertaken through the Water Service Development Plans.

Nevertheless, the Free Basic Water Policy was basically a political promise, building on a long history of promises of free services: and as it was enshrined in the Water Services Act, the Government had no option but to implement it. Although investigations into its implementation started in 1999, according to DWAF, it seems that politicians may have introduced it before the administration was fully prepared for implementation. This meant that a number of problems have emerged. As a result, many municipalities are still grappling with the idea and how they can possibly implement it in practice. Although the free basic water policy might affect the need for pre-paid meters, the conclusion from most operators is that they are most useful as a way to control consumption than as a way of increasing revenues. Therefore, the policy does not affect their technological choice, provided the smart cards (or tokens) can be pre-programmed to allow for the free water allocation.

For less affluent municipalities and especially rural areas, this policy will be costly and therefore, might be impossible to implement. Consumption is well below the recommended lifeline allowance of 6 cubic meters, which means that there would be no revenue collection at all. With limited potential for cross-subsidisation and insufficient transfers from central governments, many municipalities and village water committees have to find ways round the free water policy in order to avoid bankruptcy. And in fact, many poor customers have understood that long-term financial viability of water systems is in their interest, and simply continue to pay.

Strategies currently used by the municipalities for the free water policy include a combination of rising block tariffs, often with a low rate for the first block, and targeted rebates to poor households are being used to provide pro-poor subsidies. There are, however, still a variety of routes available to encourage people to pay something, such as the payment of membership fees or other forms of payment.

Table 1 ***Subsidy Approaches in free water case studies***

Municipality	**Tariff Structure**	**Subsidy Approach & Income Structure**
Durban (Metro)	Rising block tariff, zero block 1 (6kl) to all	Internal cross subsidies & service level options

Municipality	Tariff Structure	Subsidy Approach & Income Structure
Tshwane (Metro)	Rising block tariff	Targeted internal cross subsidies through indigents policy (in old Pretoria area)
East London/ KWT(B1)	Rising block tariff in East London and a flat charge/kl in King Williams Town	Targeted subsidies through indigents policy
Polokwane (B2)	Urban areas rising block tariff, low block 1	Targeted cross subsidies through indigents policy and equitable share
George (B2)	Flat rate and declining basic availability charge with service level	Targeted cross subsidies via indigents policy and equitable share
Volksruct (B3)	Fixed monthly charge	Targeted rebate to the poor (9kl free) funded from equitable share
Lichtenburg (B3)	Rising block tariff, zero block 1 to all 5kl)	Internal cross subsidies (equitable share used for bad debts)
Douglas (B3)	Two block regressive tariff	Targeted rebates to the poor (10kl free) through the indigents policy from the equitable share

Source: Department of Water Affairs and Forestry (DWAF) (May 2001) Free Basic Water Implementation Strategy Document.

G1.4 CASE STUDIES

G1.4.1 Rand Water and ODI Retail

Rand Water is a publicly owned water board and the bulk water supplier for the region of Johannesburg (Gauteng). According to the Water Services Act (1997), Water Boards are permitted to undertake other activities (other than their primary functions of supplying bulk water), provided that this does not limit the Boards' ability to undertake their primary activity or place a financial strain on the entire operation. As a result, water boards can for example provide water services on contract or in joint venture with water authorities or provide other types of services, such as management, training and support services or catchment management services.

Following DWAF's initiative, Rand Water has signed a contract with municipalities in the ODI region for provision of retail services in former township areas. Given that the cost-recovery record is particularly poor in these areas, Rand Water has put considerable efforts in the development and installation of pre-paid meters, for both individual and standpipe connections.

Pre-paid meters are seen as a way of keeping down costs through reducing losses from uncontrolled use.

G1.4.2 Krugersdorp municipal water services

Krugersdorp is a municipality lying West of Johannesburg. Water services are provided through a municipal water company, which is ring-fenced from other municipal services but still falls short of being corporatised. Krugersdorp is typical of formerly white municipalities whose boundaries have recently been extended in order to incorporate black townships. However, management quality appears to be significantly higher than in other municipalities: it is akin to the success story of municipal water and sanitation service management. Krugersdorp municipality has also been experimenting on a large scale with pre-paid metering devices, in a variety of socio-economic environments. Its payment record has significantly improved since the start of these experimentations. This has been matched with particularly good budgeting practices. The municipality is currently considering a possible corporatisation of the municipal services, which should be made possible thanks to the relatively good payment records.

G1.4.3 Durban Metro water and the BPD initiative

In 1998, Durban Metro water (and the city of Pietermaritzburg) initiated the creation of two partnerships between themselves (public providers of water and sanitation services in Durban and Pietermaritzburg respectively), a private operator (Vivendi), a local NGO (the Mvula Trust), the Water Research Commission and the local bulk water supplier (Umgeni Water). The objective of these partnerships was to improve water services for the poor in Durban and Pietermaritzburg, particularly through the development of innovative approaches to water services provision. The partnerships were created through two co-operation agreements, with one for each city, which outline roles, responsibilities and financial commitment for these partnerships. Powers in the partnership are equally shared, and financial contributions do not imply more weight in decision-making. [1]

New approaches to service provision developed by these partnerships did largely focus on addressing the cost-recovery challenge. The free water policy was first introduced in Durban through the municipality of Durban, but this policy was largely seen as a cost-limitation mechanism in such a setting. Durban Water established that it would be cheaper to provide 6 cubic metres of water for free to everyone in Durban rather than to try and recover bills in areas where access may be difficult, or even dangerous.. In many township areas around Durban, payment records have traditionally been very low: there is either a "culture of non-payment" (inherited from the Apartheid era)) or a "non-payment" culture, as discussed above. In order to increase the financial viability of this policy, they have introduced a number of innovations

(1) Note that these partnerships received considerable support and attention from the Business Partners for Development initiative, for which the Kwazulu Natal projects are one out of eight pilot projects.

on flexible service levels, with for example the introduction of restricted services, where roof tanks are provided and may be refilled daily for a fee.

But Durban Water, one of the most efficient water utility in the country, is a special case, as it can easily recoup the costs of this policy through cross-subsidisation from a relatively rich household and industrial customer base.

G1.4.4 Kwazulu Natal rural services: Nkwambase

ERM visited the Nkwambase project, in a rural area North of Durban, in the Kwazulu Natal province. The project serves a total of 800 households. For this project, the development engineering firm Dynacon works as sub-contractor to Umgeni Water, which is the bulk water supplier in the region of Durban.

The approach is different from Durban Metro's. Umgeni has installed conventional meters for consumers, equipped with a lock to prevent tampering. Project operation was initially entrusted to a local Water Committee, with elected representatives from the community. However, this committee was disbanded once they ran out of money and had to be replaced by a small Task Team, comprised of more competent and responsible people. This Task Team is managing in difficult times but hopes that a more conventional business unit would be put in place in order to manage the business. In financial terms, most people are not paying, hence, Umgeni has never received fees for its bulk water. While these payment arrears mount, Umgeni has decided not to disconnect its customers. Instead, they are hoping that the municipal council will settle the total accumulated debt.

In ERM's site visit, the cashier, a representative of the task team, displayed some relatively good knowledge of the business. He said that they could not connect anyone who wanted to because costs can be particularly high, so they would need to increase the connection fee in order to cover those costs. In addition, he believed that they would need to increase the tariffs given that two increases in bulk water prices had not been reflected into their retail tariffs. However, they are dependent on the local municipality for agreeing tariff increases.

G1.4.5 Peddie South and the Eastern Cape BoTT project

Contractual framework: the BoTT contracts

South Africa has created a new model for linking business, government and civil society stakeholders in the water systems development process. Rather than following the traditional buyer-seller relationship of the commercial contract, there is continued emphasis on "co-development", as exemplified by the BoTT contracts.

In 1997, DWAF signed BoTT (Build, operate, Train, Transfer) contracts with "Project Implementing Agencies" (PIA) in each of South Africa's four poorest

provinces. Each PIA is a consortium between private sector actors and NGOs: for example, both the Northern Province (Metsico) and the Eastern Cape (Amanz'abantu) consortia are led by WASS (a subsidiary of Northumbrian Water) and have the Mvula Trust, a nation-wide NGO specialising in providing water services to the rural poor as partner for institutional and social development aspects. The four BoTT programmes were first established with the objective of carrying out 100 small-scale projects.

The rationale for designing this type of contracts was to accompany the municipal service reform and to allow a quick transfer of responsibilities for water and sanitation from DWAF to the local governments. Given that in many poor rural areas, local governments did not have the capacity or the financial resources to take on such responsibilities in a short period of time, DWAF developed the BoTT concept for accompanying and overseeing this transfer.

The contracts themselves are very detailed management contracts designed using FIDIC contract formulation. They were let via a competitive tendering process, which used a scoring process to evaluate the candidates' skills and experience in the following areas of skills: design, construction, operation and maintenance (O&M), on-site sanitation and institutional and social development (ISD). In addition, points were awarded for Historically Disadvantaged Companies (HDC) who would act as shareholders and sub-contractors as well as use of community based labour and methods.

The contracts require the consortia to offer a "one-stop shop approach" covering these five areas of skill. Effectively, this is achieved through the establishment of a project management structure (the "Project Implementation Agency"). The PIA is in charge of overseeing the services provided by the Lead Service Providers as well as any other company or community representatives that the latter supervise. Community representatives work as partners on the project, as members of the Project Steering Committees and Village Water Committees.

The overall objectives of the contracts are:

- To carry out assessment of community demand and willingness to pay for water supply services;
- to design a tariff structure and payment mechanisms which respond to the results of the assessment;
- to plan the scheme including water source investigation and development, environmental scooping and impact assessments, feasibility studies etc.
- to design and build a community stand-pipe network which responds to the identified need in accordance with the criteria required by the "Reconstruction and Development Programme" (i.e. 25 litres at 200m minimum standard);
- to operate the system, during the agreed operation and maintenance phase, including the collection of tariffs, to ensure that the designed scheme is robust technically and economically; and

- to manage the hand-over phase (or "Transfer") to local-government.
- To provide post transfer mentorship for the scheme.

These contracts are now coming to an end, as they were initially signed for two-years and renewed once. Both self-criticism (by DWAF, due to the relatively high cost of the programme) and external criticism (by NGO partners, due to their limited ability to strategically orient the projects) are running strong. However, it is generally recognised that these project management structures have been successful at delivering rapid improvements in service delivery with appropriate attention paid to the long-term sustainability of the schemes established in such a way. Private sector operators have been quick in recognising the interest of such approach, and are trying to win more projects outside the BoTT structure directly with local governments. Indeed, following that experience, DWAF decided to develop an "improved" BoTT model contract, which could be used directly by local governments wanting to call on the private sector to develop their water services on the basis of this "one-stop shop" approach.

Table 2 ***Advantages and disadvantages of the BoTT approach***

Advantages	Disadvantages
• Allows to make considerable public investment in a short time: speedy and efficient • Provides a good overall project management structure for running many small schemes • Integrated approach to project cycle • Draws on expertise from various disciplines for various tasks (business planning, construction, O&M, ISD, mentorship and transfer) • Moves away from a strictly engineering-driven approach to one where institutional and social development specialists can have a say about the project structure • Strong emphasis on building capacity, both at water service authority level and at village level • Helped the establishment of consortia centred on private operators who can now work on small-scale projects originating from local government on a more competitive basis	• No direct investment by the private sector • Costs are higher than if projects were implemented in a traditional way (although those added costs may be the price to pay for a speedier implementation) • Local governments were not sufficiently implicated into the process, which was decided and implemented before the local government reform • Insufficient emphasis on training of future water service providers • Few schemes have been transferred to date; difficult to assess the relative success • The impact on local service providers not included in the PIA might be severe, given that they can not compete for those projects during quite a lengthy period of time

G1.5 PEOPLE AND INSTITUTIONS MET IN SOUTH AFRICA

- Richard Riddle, Managing Director, PSU International
- Paul Smith, Director, PSU International
- Manny Van Zyl, Operations Manager, PSU International
- Samuel P Molekoa, Project Co-Ordinator, Rand Water
- Kobie Mare, Operations Engineer: Water, Rand Water
- Dugald Ross, Operations Engineer, Rand Water
- Steve Kilbey, Rand Water
- Ian Palmer, Managing Director, PDG
- Mthobeli Kolisa, Consultant, PDG
- Jean-Pierre Mas, Operations Executive, Johannesburg Water Ltd
- Gerhard R. Backeberg, Research Manager, Water Research Commission
- Martin Rall, The Mvula Trust
- Jamie de Jager, Regional Co-Ordinator, The Mvula Trust
- Martin Cooney, Area Manager, Amanz Abantu Services Ltd
- Mlungisi Bangani, ISD Co-Ordinator, Amanz Abantu Services Ltd
- Oliver Ive, Amanz Abantu Services Ltd
- David Still, Director, Partners in Development
- David A. Stephen, Director, Umgeni
- Minnie Venter-Hilderbransd, Mvula Trust
- Patrick Rousseau, Project Manager, Vivendi
- Graham Simpson, VKE Engineers Durban
- Lansan Marah, Sigodi, Marah Martin, Development Consultants
- Rod Alence , Sigodi, Marah Martin, Development Consultants

Public Institutions

- Dr Sylvain Perret, Associate Professor, University of Pretoria
- Prof. Rashid Hassan, University of Pretoria
- Helgard Muller, Director: water services intervention and operations support, Dept. Water Affairs and Forestry
- Hugh Sussens, Intervention and Operations Support, Dept. Water Affairs and Forestry
- Dave Rimmer, Dept. Water Affairs and Forestry, Durban
- Dr Barry M Jackson, Policy Analyst, Development Bank of Southern Africa
- Craig Thompson, Deputy Director: Engineering Services, Amatola District Council
- Mike Rabe, Deputy Director: Water, Mogale City
- Peter Smith, Water Sector Field Manager, DFID
- Martin de Wit, CSIR

Annex H

Financial instruments that can help promote cost recovery

INTRODUCTION

This Annex provides an overview of the type of financing instruments that could be used to help trigger the sustainable financing of water and sanitation services. It is adapted from an Annex that appears in a paper prepared by ERM for DFID relating to Finance and the EU Water Initiative (ERM 2002).

The annex looks at financing instruments such as

- Tariffs
- Grants
- Loans
- Mixed Credits
- Micro credit/ micro finance
- Output Based Aid
- Risk guarantees
- Bonds
- Debt Swaps
- Equity; and
- Direct Private Investment.

Who needs access to finance and why?

Various stakeholders in the WATSAN sector may need to gain access to finance to help kick start and sustain their schemes or programmes, but as noted in the research they may be unable to access commercial finance due to numerous constraints.

A variety of financing instruments exist that can help to address some of these financing constraints. Often, however, mainstream financial markets do not provide these financing instruments to developing countries, or, when they do they provide them under unfavourable and prohibitive conditions.

In these cases, financial support (from either a national government, overseas aid agencies or an NGO) could play a clear role in "unlocking" this financing problem. Thus, while overseas aid is often used to provide funding and technical support, it should – and could – through innovative instruments, be also used to leverage additional financing.

Types of financing instruments

User Tariffs

Financial costs and tariffs are discussed in detail in *Section 2* of the main report.

To summarise, tariffs should be the main source of finance for water and sanitation services and this will often require tariff reform. Indeed, as a result of operational inefficiencies and political considerations, user tariffs for water are often below cost-recovery levels, meaning that paying customers pay less than they should. While there is some disagreement about whether cost-recovery should include operational costs, the costs of capital maintenance charges, or also the costs of servicing capital, many tariff structures fail to recover even operational costs alone.

Where tariffs are targeted to the poor, either through collection of socio-economic indicators or geographically, high levels of both inclusion and exclusion often result, with the effect that most people who are subsidized don't need it, and those who need it often don't qualify.

Grants

Most overseas aid flows are in the form of grants, which are either tied (conditioned upon purchases from suppliers in the donor country) or untied, depending on the type of grant and the policy of the donor. While there are many different types of grants (such as seed grants or matching grants), which can be used for different purposes, the basic principle behind a grant programme is that it does not have to be repaid.

When grants are tied to specific projects and programmes, they are too often provided without any performance requirements. Many WATSAN programmes and projects are funded via grant programmes on this basis; hence many WATSAN programmes and projects are not required to recover their costs. This has perhaps contributed to the lack of cost-recovery and overall poor performance within the water sector and the belief that water lacks an economic value.

In recent years, however, there has been a clear move away from programme or project grants towards direct budgetary support, in the context of Poverty Reduction Strategy Papers prepared by recipient countries.

Direct Budgetary Support as Part of the Poverty Reduction Strategy (PRS) Process). PRSs are becoming increasingly important in the development process, as they offer a broad framework for external aid and funding priorities for government budgets, set by developing countries themselves through demand-driven, participatory methods.

PRSs came about as a result of the poverty trends that emerged in the 1990s, especially in the poorer countries of Africa, along with reform of HIPCs, and the evident lack of success of conventional IFI approaches to conditionality.[1] Also, the movement towards PRSs and away from funding investment projects and programmes in specific sectors came as a result of projects (such

[1] Ref. "Introduction to PRSPs: Implications for the Way We Do Business In The Energy Sector", presentation at the World Bank Energy Week, by Francoise Clottes

as in the WATSAN sector) that focused on supply-side approaches with an emphasis on the technical and physical infrastructure, without accompanying funding for its financial sustainability - operations, management, and maintenance. As a result of these weaknesses (combined with a lack of attention paid to a project's social and environmental considerations), many of these projects often failed.

PRSs aim to facilitate the development of a country-wide, comprehensive strategy to address poverty using the resources from private, public, and civil society organizations, with medium to long-term plans for outcomes and budgetary commitments. The process steers away from a project-based approach towards sector-wide approaches to address poverty, while addressing the accompanying budgetary support required. The process is to be instigated by developing countries themselves, but is increasingly a requirement for HIPC countries seeking debt relief.

Loans

Loans for WATSAN investments can be provided either on a commercial basis by commercial banks or on a "soft loan" or "concessionary" basis by development banks and international financial institutions.

Commercial loans are not prevalent in Africa and do not represent a specific form of ODA so are not developed in much detail here. However, the provision of risk guarantees for commercial loans can be a financial instrument for ODA (see below)

Soft loans are generally used for infrastructure development projects, such as WATSAN. They offer low or no interest rates over varying amounts of time, and most of the loan itself – up to 80% – is provided as a grant from the donor country. Unlike mixed credits, however, soft loans are usually untied, which increases the ability to strengthen local regional economies. Recently, soft loan credits have been used to finance WATSAN projects in Jamaica and Jordan. In Jordan, a soft loan from Germany was provided to support several governmental and non-governmental organisations to promote sound water management.

Soft loan facilities and mechanisms can help to further infrastructure development by providing finance and programs for projects that would be unable to obtain credit elsewhere. These should be provided as part of a broader strategy to promote sector reform and, within the water sector.

A specific form of soft loan is the *Poverty Reduction Strategy Credit (PRSC)*. Countries that are eligible for World Bank IDA loans can apply for PRSCs, which were created as part of the shift in strategy towards poverty reform. PRSCs are part of a broader program to support medium-term policy and institutional reform programs to help implement the PRSP process. PRSCs are targeted for specific, prioritised policy action that have been identified through the PRSP process, and continued funding is contingent upon meeting clearly defined targets.

Mixed Credits

Mixed credits combine aid and supplier financing for a project, and generally applies to "hard" infrastructure. Because of the stipulations for private financing, many developing countries are unable to access mixed credits. Mixed credits are also often tied, meaning that goods and services must be procured in the country where the funds originate.

Within the OECD, the OECD Consensus Agreement on Export Credits governs mixed credits. This agreement asserts that tied aid credits should "provide needed external resources to countries, sectors, or projects with little or no access to market financing."(1) Water supply and general environmental matters fit well within this mechanism.

An advantage to the mixed credit mechanism is the engagement of a financial business model that includes private sector for infrastructure at affordable terms, along with an emphasis on cost recovery in project design. A challenge in implementing mixed credit schemes may include how to avoid the project being supply-driven – a particularly important issue for projects aiming to provide services to the poor in rural and peri-urban areas.

Micro-credit/Micro-finance

Micro-credit mechanisms provide start-up capital for local entrepreneurs at affordable rates while promoting self-finance for projects and initiatives. Microfinance tends to be based on local demand, where the borrower understands basic accounting and finance. In the past, micro-credit mechanisms have not been promoted for the water sector, although this has been changing slowly in different places around the world, including Honduras, Indonesia, Ghana, South Africa, India, and Pakistan.

Recent research concerning the application of micro-financing schemes for water and sanitation has shown that it is most effective when individuals and communities are provided with a range of technological and financing options. This corresponds with demand-responsive development approaches. Additionally, cost-recovery and the development of local capital markets are integral parts of micro-finance, which has a strong link to the evolving approach to a more sustainable water sector.

Despite these advantages, micro finance requires a high dependency on grant funding to kick start the sector, along with other constraints including sometimes negative perceptions towards savings and credit among the poor, and an overall lack of capacity in the institutional and accountancy skills required to mange micro finance schemes.

Output-Based Aid (OBA)

Under OBA schemes, donor aid to private firms, NGOs, or the public sector is linked to clearly defined performance measures. Thus, as development practices shift towards more demand-responsive development approaches, output-based aid provides a practical way to monitor and evaluate the progress and effectiveness of funding over time.

An output-based strategy can be applied to subsidies and tariffs, contracts, and programs, for example through the PRSP process. As part of the process, donors and recipients need to establish the role of funding, clarify the responsibilities of all parties, define performance, determine how the scheme will be administered, and link payment to performance.

More widespread use of OBA principles linked to grant funds may raise the profile of cost recovery and other targets for sustainability in the water sector, along with promoting accountability in both systems and financial management.

Risk Guarantees

To address the variety of risks – both operational and political, and other - associated with operating in developing countries, private sector operators often require a guarantee on their investments, which are likely backed by international institutions, and sometimes partially by governments if the institutional environment is strong enough.

Risk guarantees act as a form of insurance for loans associated with financing infrastructure projects. They serve to neutralise country risk, and can be used for more favourable lending terms. Within the water sector, the involvement of local and national governments as part of a financing consortia increases the perceived risk, due to the increased possibility that these governments might call in a bond or breach the contract depending on their political and financial situation.

Risk guarantees are useful as they facilitate investments in areas where project development might otherwise be unfeasible. The premise of risk guarantees could be extended and scaled down to serve the needs of programmes and projects that serve the poor, such that economic interests are protected in case of default, political circumstances, environmental damages, or other unintended circumstances.

Bonds

Bonds are debt issued by governments or companies to investors, who in return for their investments receive a set amount of interest for a set amount of time. In developed countries, an active bond market allows for stable and often tax-free investing for infrastructure projects.

Bonds are relatively safe investments, provided that the issuer is stable. The more stable the investment, the lower the interest paid on the investment. In developing countries, bond market development relies heavily on macro-economic conditions and local capacity (e.g., stable inflation, regulatory structures, etc.).

In industrialised countries, water sector infrastructure projects are often financed through bond markets, due to their long-term, stable nature and large capital costs. However, there are very few capital markets in developing countries (especially in Africa) that are capable of supporting a bond market at present, although efforts to increase the capacity to support local markets would be a welcome step forward towards sustainable development goals.

Debt Swaps

Debt swaps are a mechanism to reduce the debt loads of poor countries in exchange for investment in basic infrastructure services. As many developing countries spend over 50% of their GNP annually on debt payments, debt swaps are a useful way to instigate reform towards sustainable development while increasing capacity to maintain and further the reform process.

As part of the World Bank's Debt Initiative for Highly Indebted Poor Country (HIPC), which is closely linked with the PRSP process, debt swaps can be a useful means to ensure investments in the water sector. By tying debt swaps to performance-based outcomes including cost recovery and good governance procedures – such as public accounting and increased transparency – donor countries can help shape the environment for reform while improving capacity for sustainable development and increased access to basic services.

Equity

Donors (or private sector actors) can also choose to take a direct equity participation in water utilities or any other water institutions run on a semi-private basis. As this is long-term financing (with a corresponding sharing of liabilities and potential upturns), this can provide a solid basis for such utility or institution to invest. A specific form of equity investment is the provision of venture capital, i.e. seed funding for investments, which generally relates to projects that yield a high return. While some individual schemes in peri-urban or rural areas can yield high returns, a WATSAN programme consisting of these sorts of schemes is probably seen to be too risky or inaccessible for an equity investment to take place. Expectations to this rule may be equity financing vehicles specifically designed to help finance infrastructure in developing countries, such as the Emerging Africa Infrastructure Fund. However such funds have not e been used to date, to trigger finance for prop-poor WATSAN programmes.

Private utilities would generally be financed via a mix of debt (loans and bonds) and equity finance and would seek to optimise their debt/equity ratio in order to make the most of the tax breaks on debt finance. For this reason, high leverage ratios (i.e. high level of debts versus equity) might be preferable

up to a certain level where debt finance becomes too expensive because of an increase in the credit risk of the utility.

Direct Private Investment

Finally, private operators can contribute direct private investments without necessarily contributing equity. This is typically the case in the water sector where the model of "delegated management" has tended to prevail over the divestiture model (which leads to equity participation), which is most prevalent in commercial sectors and other infrastructure sectors. The social and political value of water has made it somewhat difficult for many countries to grant majority share holding in their water institutions to private investors, although partial divestiture is relatively common. Table H1 below presents some common ways of obtaining various degrees of direct private sector involvement and different risk-sharing arrangements.

These various forms of private sector participation can bring varying levels of private finance. The highest level of investment requirement for a private investor would be under a concession agreement, whereby the operator needs to invest in long-term infrastructure. In other forms of PSP (say a lease or a service contract), private investment would be limited to a contribution to the costs of short-term investments, such as computer systems or premises.

Table H1 Private Participation and Government Capacity

	Requirements				
Option	**Stakeholder support and political commitment**	**Cost-recovering tariffs**	**Good information about the system**	**Developed regulatory framework**	**Good country financial rating**
Service Contract	Unimportant	Not necessary in the short term	Possible to proceed with only limited information	Minimal monitoring capacity needed	Not necessary
Management contract with fixed fee	Low to moderate levels needed	Preferred but not neccesary in the short term	Possible to proceed with only limited information	Minimal monitoring capacity needed	Not necessary
Management contract with performance incentives	Low to moderate levels needed	Preferred but not necessary in the short term	Sufficient information required to set incentives	Moderate monitoring capacity needed	Not necessary
Lease	Moderate to high levels needed	Necessary	Good system information required	Strong capacity for regulation and coordination needed	Not necessary
BOT	Moderate to high levels needed	Preferred	Good system information required	Strong capacity for regulation and coordination needed	Higher rating will reduce costs

			Requirements		
Concession	High levels needed	Necessary	Good system information required	Strong regulatory capacity needed	Higher rating will reduce costs
Divestiture	High levels needed	Necessary	Good system information required	Strong regulatory capacity needed	Higher rating will reduce costs

Source: World Bank Water and Sanitation Toolkit. http://rru.worldbank.org/Toolkits/water/index.htm

Annex I

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