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The Role of Engineers in the Demand Responsive Approach

A case study from South Africa

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A case study from South Africa

Annette Bos

*Edited by
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Preface

While I was training as an engineer in the late 1960s and 1970s, the main emphasis of the training was on producing (and implementing) a cost-effective technical solution to a defined problem. Later we learnt from experience that this was not enough. People did not necessarily buy the cars which the mechanical engineers designed, and they did not necessarily use the water and sanitation systems which civil engineers designed and constructed. These problems were compounded by the requirement that people would pay the full cost of the engineer's solutions, without government subsidy.

Nowadays of course, engineers work more closely with other professions, and we are aware that our products must compete (on price, specification, service, and status) with other products and people's existing facilities. At the same time we have learnt that this provides us with new opportunities: in recent years established service industries like television and telecommunications have achieved huge growth through offering their customers enhanced services (extra TV channels, mobile phones) at a higher price. This expansion has not been confined to industrialised countries, and in the developing world growth has included an increase in the number of people accessing lower cost basic services, as well as the move of existing customers to more expensive services.

In parallel with this, engineers working in development have had to contend with chronic shortages of public funds, especially for operation and maintenance. In the water and sanitation sector we have become more aware of the importance of the service which people receive, rather than the physical infrastructure. We have learnt that the sustainability of this service depends on operation and maintenance, including management and arrangements for paying the running costs of the systems year after year. Back in 1992 the International Conference on Water and Environment in its Dublin Statement laid down the fundamental importance of stakeholder participation, the central role of women, and the economic value of water, emphasising the multi-disciplinary issues in the sector.

This is the background to the Demand Responsive Approach (DRA) which has been advocated by the World Bank and others in recent years to ensure that key investment decisions are guided by consumer demand. As Annette Bos outlines in this study, one of the key characteristics is that communities or individual consumers should make *informed choices from a range of options* for their water supply and sanitation services, with payments related to the cost of the option. This provides opportunities for people to choose a higher level of service (e.g. water supply to a tap in their own yard) by paying more. And it reduces the service's dependence on scarce public funds.

The demand responsive approach has become internationally recognised as an approach to increase sustainability of water projects. In the application of DRA, the role of engineers is vital for ensuring that communities have the necessary information on which to make decisions—therefore engineers must have a different role than in the past.

In this study Annette Bos considers these issues in the context of South Africa, interviewing 62 people (including 38 engineers) working in the water sector in the year 2000. The study was conducted as an Individual Research Project at WEDC, part of her MSc programme in Water and Waste Engineering. She establishes the ideal role of an engineer in DRA and the external factors influencing this role, comparing these with the existing role of the engineer. The gap between the ideal and the existing role is discussed, including weaknesses in the knowledge, skills and attitudes needed when working with communities and using a demand responsive approach. The study presents conclusions on this gap and the feasibility of engineers adopting DRA in South Africa. Readers should note that these conclusions were prepared before the South African government announced (in September 2000) that a basic supply of water would be provided free of charge to the poor. This will clearly have major implications for the funding of water supply and the feasibility of DRA in South Africa.

This study will be of interest to engineers and others working in the water sector in developing countries. I think it has a wider application however, with implications for universities and professional organisations. As indicated above, engineers' roles have changed substantially over the last 30 years in many sectors and in industrialised societies as well as in developing countries. The formal education and training of engineers however is still very technically based – for example a comprehensive and authoritative guide to civil engineering procedures (Institution of Civil Engineers, 1996), does not consider how civil engineering projects impact on people nor the possible role of the community in the project. Similarly these issues do not feature in civil engineering textbooks and professional journals, nor in the formal assessment process (essay topics) for applicants to the Institution.

The issues raised in this study relate to two research projects being undertaken by WEDC and funded by the UK Department for International Development (DFID) under the Engineering Knowledge and Research Programme. The first is to prepare a Practical Guide for engineers and managers on Mainstreaming Gender in Water Projects. The second is to prepare Guidelines on the engineer's role in Designing Water Supply and Sanitation Projects to Meet Demand. These projects are being undertaken in collaboration with Mvula Trust and the Council for Scientific and Industrial Research (South Africa), UNICEF (India), NEWAH (Nepal) and OXFAM (Tanzania). The main outputs are due to be published in 2001 for both projects. Information and progress can be monitored at <http://www.lboro.ac.uk/wedc/projects>

WEDC research and education focuses on the interdisciplinary analysis of physical infrastructure and services for development, and we hope that publication of this study will contribute to this.

Ian Smout

WEDC, 2001

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The author would like to thank all those who have contributed to this study. Clearly, this report could not have been written without the open expression of thoughts and views of the engineers. I would like to thank them sincerely for sharing their valuable insights and time.

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Acronyms and abbreviations

BoTT	Build operate Train Transfer
CVM	Contingent Valuation Method
DC	District Councils
DLGH	Department of Local Government and Housing
DOF	Department of Finance
DRA	Demand Responsive Approach
DWAF	Department of Water Affairs and Forestry
L/c/d	Liters per capita per day
ISD	Institutional and Social Development
NGO	Non Governmental Organisation
PA	Project Agent
PHAST	Participatory Health and Sanitation Transformation
PDF	Project Development Facilitators
PDG	Palmer Development Group
RDP	Reconstruction and Development Programme
RP	Revealed Preference
SARAR	Self-esteem, Associated strengths, Resourcefulness, Action planning, Responsibility
SC	Social Consultants
TA	Training Agent
WSA	Water Service Authority
WSP	Water Service Provider
WSSU	Water Sector Support Unit
WTMC	Willingness to make other Meaningful Contributions
WTP	Willingness to Pay

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Executive summary

In 1994 it was estimated that more than 12 million South Africans lacked access to clean water. (DWAF, 1994). The South African water supply sector has made significant progress over the past years as in 1998 Department of Water Affairs (DWAF) indicated that it had served 3 million people, who were previously without basic supply. Despite this progress, there is much doubt as to the sustainability of these water projects (Mvula Trust, 1998).

Evaluations of DWAF projects show sustainability problems including issues such as affordability and technical design, operation and maintenance and cost recovery. Based on international experience, water supply systems have an increased chance of sustainability if community and management are strengthened (Breslin, 1999).

The policy and practice adopted by DWAF at present is resulting in projects being implemented in a supply driven approach (Webster, 1998). Such a 'top down' approach should be reconsidered as it does not allow communities to get fully engaged in the projects.

The demand responsive approach (DRA) is advocated both internationally and in South Africa as the approach to ensure sustainable water services because communities are fully engaged in the project process. Although DRA is widely discussed, it has not been adopted in practice. The adoption of DRA can only happen if supply agencies, including technical consultants are able and willing to take a different role.

Outline of the problem

DRA means ensuring that consumers can choose the level of service that meets their needs and for which they are willing to pay or willing to make any other meaningful contribution. Consumers should also decide how the project is managed. In order for the communities to be able to take decisions, they have to be informed about their options. One of the things that prevents the community in decision making is the attitude of engineers that "they know best" and that the so called 'experts' have always sold the problem of drinking water as a purely technical problem (Roy, 1999). In the application of DRA, the role of the engineer is vital to ensure that demand gets informed and developed at community level and that the communities are able to make informed choices. Therefore engineers must have quite a different role from the one they had in the past

This paper draws on a literature review and interviews (as outlined in the methodology below) investigating the role and characteristics of engineers in DRA, and identifies the

gap between the engineers' characteristics in current approaches and DRA and external factors influencing adoption of DRA by engineers. It establishes the views and attitudes of engineers to adoption of DRA and considers the feasibility of engineers adopting DRA in South Africa.

Methodology

The following methodology is used to investigate the problem as outlined above:

- **Literature review of existing documentation;** this review looked at DRA and the role and impacts on engineers when this approach is adopted.
- **Key informant interviews;** to gain an understanding of specific and current issues in the water sector.
- **Semi-structured interviews with the engineers:** 1) to establish the current knowledge, attitudes, perceptions, actions and practices of engineers, 2) to gain understanding of issues affecting their role, 3) to establish views and attitudes regarding DRA, and 4) to hear the engineers, so that their voices can be taken into account when making recommendations.
- **Semi structured interviews with project development facilitators and social consultants;** to provide information on the role of engineers from an external point of view.

A total of 62 people have been interviewed. The interviews have taken place across the water sector and included representatives from government, non-governmental organisations (NGOs), and private sector. A total of 38 engineers have been interviewed. The sample of engineers include engineers at design, implementation, project management and managerial level.

The role and characteristics of the engineer in DRA

The role of the engineer is to provide information to consumers on the options available and to respond to the resulting demand. The engineer needs to inform, assess and respond to demand by informing the households on different technical options, including sources and levels of service, with matching costs, operation, maintenance and management of the options and how the service will be delivered. A view of the community as client, of non-technical matters, and of the community (as a whole) should be taken into account in designing of the options. The households should be informed of benefits and constraints of each option. The designs have to be sufficiently flexible to accommodate a number of different service levels to match both current and future demand. This role requires different characteristics (knowledge, skills and attitudes) of the engineer. The main ideal characteristics of an engineer in DRA are:

The gap between the engineer's characteristics in current approaches and DRA

- **Inadequate ability to inform, assess and respond to demand;** Engineers have inadequate knowledge of and/or experience with 1) appropriate technologies, 2) designing for a mixed level of service based on willingness to contribute, 3) providing options to serve the community (as a whole), and 4) enabling the community to take informed decisions.

Table 1. Profile of interviewed engineers

<i>Type of organisation</i>	<i>Number of engineers interviewed</i>
DWAF	3
District Councils	4
NGOs	8
BoTT (Build operate Train Transfer) consortia	2
Water Board	1
Water Sector Support Unit	1
Technical private consultants	19
Total	38

Present designs lack technical flexibility, adaptability and do not take account of individual consumer preferences. The engineer lacks facilitation skills to guide a process of informing and decision-making, instead of strongly advising the community as at present.

- **Inadequate ability to relinquish control;** The majority of engineers find it very difficult to accept that non-technical issues can determine technical issues and not to interfere in the community participation and decision-making process. Most of these engineers feel that they know the communities and hence know what is best for the communities. Engineers often lead the projects and lack trust in other role-players, especially in the social consultant.
- **Lack of common vision between the social and technical sides of the project;** There is an inadequate understanding by engineers and social consultants of each other's roles and responsibilities at present and they are not exchanging and drawing on each other's information.

The identified gaps could be the result of the newness of the approach, the engineer's power, 'focus on things', control and sticking to standards which are all recognised as parts of the deep preferences of normal professionalism that influence the engineer's individual perception, choice and behaviour (Chambers, 1993). Engineers are likely to have 'resistance to change' to adopt DRA, as this is a recognised defence mechanism in normal professionalism.

External factors influencing adoption of DRA by engineers

- **Politics;** inadequate enabling environment to adopt DRA because of guidelines, targets and deadlines, and because of political promises and expectations.
- **Funding & Time;** the process of informing, assessing and responding to demand is an iterative process which will take time. Time is money, and at present not enough funding and/or time is allocated in the projects to carry out this process. Currently

Table 2. Main ideal characteristics of an engineer in DRA

Characteristics	Particulars
Knowledge of	<ul style="list-style-type: none">■ Sustainability factors.■ Appropriate technologies.■ Community dynamics, economics and other issues.■ Participatory approaches (basic understanding).
Skills	<ul style="list-style-type: none">■ Technical options; ability to translate consumer demand into feasible options.■ Communication; ability to feed back to and draw on information from the social consultant, ability to present options and facilitate discussion, ability to communicate with other structures, not only the village water committee.■ Ability to step back and let people think for themselves.
Attitudes	<ul style="list-style-type: none">■ Willing to communicate and put trust in a multi disciplinary team, especially the social consultant.■ Willing to accept non-technical issues to determine technical issues.■ Willing to design for the community as a client and take their needs into account instead of designing the best infrastructure.

inadequate time and/or funding (which could result in lack of capacity) are allocated by funders to monitor the project implementation by engineers. There is no incentive for engineers to adopt DRA if they are not monitored.

- **Contracts and terms of references;** these are focused on the technical and infrastructural aspects of the projects and are not clear on exact responsibilities of the engineer, for example concerning community involvement.

The engineers' views and attitudes to DRA

DRA is a new term for the majority of the engineers and the knowledge of this approach is limited among engineers. Most engineers agree that the approach is likely to contribute to sustainability of rural water projects. About 50 percent of the engineers would be willing to (partially) adopt the approach and change (some of their) current practices.

Feasibility of adoption of DRA in South Africa

A substantial gap has been identified between the existing and ideal role of engineers and the existing and ideal influencing factors. It could be argued that this found gap does not matter in the South African context, as DRA is not formally adopted as an approach by most funders. Also current issues, such as the consideration by the Minister of a “life-line” scheme that offers South Africans a basic amount of water **free** of charge, and the transfer of responsibilities to district councils could give a different focus to the water service delivery in South Africa. Adoption of the scheme would mean that DRA as means of establishing willingness-to-pay is no longer considered as appropriate to the water service delivery. If the government policy is to subsidise fully a basic level of service then demand still needs to be ‘captured’ in order to encourage a sense of ownership, with associated managerial responsibility, which enhance sustainability. As District Councils have recently been created, they have limited experience and capacity in implementing water supply projects and their approach is based on a supply driven, top down approach. It is doubted whether they understand the challenges of providing affordable, appropriate, sustainable services.

The adoption of DRA faces many challenges and bridging the gap for engineers between the existing and ideal situation might be impossible, making DRA inappropriate. However, engineers could improve and adopt many aspects related to DRA in their current approaches to water service delivery and so improve the chances of sustainability.

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Chapter 1

Introduction

1.1 Background

In 1994 it was estimated that more than 12 million South Africans lacked access to clean water (DWAF, 1994). The South African water supply sector has made significant progress over the past years in delivery of water supply projects. In 1998, (Department of Water Affairs) DWAF indicated that it had served 3 million of South Africa's people, mainly in rural areas, who were previously without a basic supply. Despite this progress, there is much doubt as to the sustainability of these water projects (Mvula, 1998a).

Evaluations of 77 projects undertaken by the Mvula Trust in 1999 highlight sustainability problems regarding issues like affordability and technical design, operation and maintenance, cost recovery, water quality and health impact, and communication. Based on international experience, water supply systems have an increased chance of sustainability if community involvement and management are strengthened and decentralised and if there is not an abdication of these roles and responsibilities (Breslin, 1999).

The policy and practice adopted by DWAF at present is resulting in projects being implemented in a supply driven approach (Webster, 1998). This approach does not allow for communities to become fully engaged in the process. Such a 'top down' approach should be reconsidered in order to increase the chance of sustainability of water projects (DRA, Conference, 1999).

The demand responsive approach (DRA) is advocated by organisations, such as the World Bank (internationally) and Mvula Trust (South Africa), as the approach to ensure sustainable water and sanitation services. The World Bank (Sara, 1999a) describes DRA as an approach where consumers are engaged in the process of selecting, financing, implementing and managing systems that meet their demands and willingness to pay. This means that in DRA the decisions regarding the project are taken by the community. DRA is a fundamentally different approach to rural water and sanitation service delivery, in comparison with supply driven approaches, wherein supplying of a service is based on assumptions regarding people's need.

Although DRA is widely discussed and policy makers are starting to adopt DRA (Mvula Trust, 1999), a full adoption of DRA has not happened in practice. One of the reasons is that in many cases the supply agencies are still driving the implementation (Sara, 1999b). It is implicit that adoption of DRA can only happen if supply agencies, like DWAF, Local Government, NGOs, technical and social consultants are able and willing to adapt to a different role.

1.2 Outline of the problem

Adopting a demand responsive approach is recognised as one of the key issues to sustainability of water projects (World Bank (1998), Mvula (1999), DRA conference (1999)). This means ensuring that households can choose the level of service that meets their needs and for which they are willing to contribute. Consumers should also decide how the project is to be managed.

In order for consumers to be able to take decisions, they have to be informed about their options. The chief problem at the option-choosing stage, is that the engineering support may prematurely close on alternatives, based on the engineer's judgement of what is appropriate (Garn, 1998). One of the things that prevents the community in decision making is the attitude of engineers that "they know best" and that the so called 'experts' have always sold the problem of drinking water as a purely technical one (Roy, 1999). In the application of DRA, the role of the engineer is vital for ensuring that communities make informed choices. Achieving this in practice presents the engineer with technical and non-technical problems (WEDC, 2000). In order to engage in the DRA process, engineers must have quite a different role from the one they had in the past.

1.3 Aims

The aim of this study is to investigate the role and characteristics of an engineer in DRA, to identify the gap between ideal characteristics of an engineer in DRA and existing characteristics of engineers in current approaches, and the gap between ideal external factors for adoption of DRA by engineers and these factors at present. The research establishes the views and attitudes of engineers on DRA and the adoption of DRA. It considers the feasibility of engineers adopting DRA in South Africa, in the context of the external influences and factors affecting the engineers. The research argues that the adoption of demand responsive approaches in water delivery has a great impact on the role and characteristics of most engineers.

1.4 Scope of the study

It is acknowledged that the adoption of DRA is not only dependent on the engineer's role but may be influenced by many other factors. However, it is felt that the engineer has a vital role to play and not much attention has been given to this in literature and practice. The study's main focus is on engineers, but they should not be seen in isolation. Therefore the study will not exclude other important factors affecting and influencing a demand responsive approach.

INTRODUCTION

The important role of the social consultants is certainly recognised. Because of time, size and the focus of this study, this role has not been researched in as much depth as the engineer's role but will be discussed where appropriate.

The main focus of the study is on rural water delivery. Water service delivery is often discussed and considered concurrently with the provision of sanitation, for health reasons. However, to keep a clear focus and because of the size of this study, only the issue of water service delivery will be discussed here.

The study is focused on the South African rural and peri-urban water service delivery sector. Fieldwork for this study has been carried out solely in South Africa.

1.5 Outline of the report

The report has been outlined as follows:

- **Chapter 2** describes and discusses *DRA*, based on a literature review, in its international context to gain an understanding of this approach and its implications. Factors and implications concerning the engineer are discussed and his/her role in the DRA process described. A model of the ideal characteristics of an engineer in DRA and a model that describes ideal external factors affecting the engineer in DRA have been drawn up.
- **Chapter 3** outlines the *existing situation* regarding water service delivery in *South Africa*. It describes the current legal and policy environment, the current approaches to implementation of water projects, taken by different funders, and the current role of the engineer and social consultant.
- **Chapter 4** describes the *methodology* used for investigation of the aims. It describes the methods used for the data collection, provides information on the profile of the respondents and describes the methods used for analysis of the data.
- **Chapter 5** describes the *analysis* of the data in a descriptive and comparative manner, as defined in the methodology chapter. The chapter finishes with a discussion of the analysis.
- **Chapter 6** presents the *conclusions* of the study and presents *recommendations* based on the conclusion. It describes the limitations of the study and identifies needs for further research.

Chapter 2

Demand Responsive Approaches

2.1 Why DRA?

Many lessons have been learnt internationally and in South Africa about successful and unsuccessful implementation of projects. Many projects are unsustainable because they were planned and implemented without responding to the demand expressed by the customer (Breslin (1999), Cairncross (1992)). Water systems which did not have people's demand, had problems of under-use, poor maintenance and poor cost recovery (White, 1997).

In order to address the problem of not responding to demand the World Bank and other organisations have moved towards a demand responsive approach for water service delivery. The demand responsive approach (DRA) is an approach that attempts to respond to a clearly expressed demand for a service. This demand is backed up by a willingness to pay or other meaningful contribution for a chosen level of service. DRA is an integrated approach to the water service delivery that takes into account technical, social, financial and institutional factors (Webster, 1998).

There is consensus among practitioners that DRA plays a critical role in promotion of sustainability (World Bank (1998), DWAF (1998), Palmer (1998), DRA Conference (1999)).

2.2 Background of DRA

In 1992 an international conference on Water and the Environment was held in Dublin, Ireland. The resulting Dublin Principles have become a common basis of an international consensus on development in the water sector (WELL, 1998). The four Dublin Principles are described in box 2.1:

Against this background, where the concept of water as an economic as well as a social good that should be managed at the lowest possible level, DRA is seen as a direct extension of these principles by the World Bank. Katz and Sara (1998) describe DRA as an approach that advocates that to manage water as economic good, projects should let consumer demand guide key investment decisions. Projects should adopt clear and transparent rules that allow users to select the level of service, technology, and location

Box 2.1. The Dublin Statement, January 1992

Principle No. 1 – Fresh water is a finite and vulnerable resource, essential to sustain life, development and the environment. Since water sustains life, effective management of water resources demands a holistic approach, linking social and economic development with protection of natural ecosystems. Effective management links land and water uses across the whole of a catchment area or groundwater aquifer.

Principle No. 2 – Water development and management should be based on a participatory approach, involving users, planners and policy-makers at all levels. The participatory approach involves raising awareness of the importance of water among policy-makers and the general public. It means that decisions are taken at the lowest appropriate level, with full public consultation and involvement of users in the planning and implementation of water projects.

Principle No. 3 – Women play a central part in the provision, management and safeguarding of water. This pivotal role of women as providers and users of water and guardians of the living environment has seldom been reflected in institutional arrangements for the development and management of water resources. Acceptance and implementation of this principle requires positive policies to address women's specific needs and to equip and empower women to participate at all levels in water resources programmes, including decision-making and implementation, in ways defined by them.

Principle No. 4 – Water has an economic value in all its competing uses and should be recognised as an economic good. Within this principle, it is vital to recognise first the basic right of all human beings to have access to clean water and sanitation at an affordable price. Past failure to recognise the economic value of water has led to wasteful and environmentally damaging uses of the resource. Managing water as an economic good is an important way of achieving efficient and equitable use, and of encouraging conservation and protection of water resources.

of facilities that best fit their needs with a clear understanding of the cost and responsibilities that these options bear.

The Dublin principles can be found in the core principles of DRA (UNDP-World Bank, 1998):

- water should increasingly be managed as an economic, as well as social good;
- management should be focused at the lowest appropriate level;
- a holistic approach to the use of water must be applied;
- the role of women in the management of water is important.

The key characteristics of DRA are (UNDP-World Bank, 1998):

- the community initiates and makes informed choices about service options and how services are delivered;
- the community contributes to investment costs relative to the level of service and has significant control over how funds are managed;
- government has a facilitative role, sets clear national policies and strategies and creates an enabling environment for the actors of all participating groups i.e. private sector and NGOs;
- the community (or representative legal body thereof) owns and is responsible for sustaining its facilities;
- community capacity is appropriately strengthened and awareness is raised to stimulate demand;

- the approach promotes innovation and recognises the need for flexibility in service delivery.

DRA was strongly advocated at the community Water Supply and Sanitation Conference in Washington in May 1998. Most characteristics are not new in the sector and the approach could be seen as a generic model. In practice DRA has been adopted, adapted and used by many international donors and implementing agencies (Deverill, 2000a). In 1999 an e-mail conference took place among water and sanitation practitioners from all over the world. There is broad consensus around the core principles of DRA and participants felt comfortable with many of the characteristics, but it was also recognised that the approach is not without limitations (para. 2.6) (DRA Conference, 1999).

2.2.1 The definition of demand responsive approach

The term demand responsiveness has created misunderstanding amongst practitioners in the sector and there is lack of agreement on what the term actually means Parry-Jones (1999) argues that the concept of demand means different things to the different professions involved in the sector:

- to engineers: the amount of water needed to supply a population;
- to social scientists: a basic need or human right (social good) that must be addressed in the context of poverty, equity and the empowerment of low income groups;
- to economists: willingness-to-pay for a particular level of service.

The economist, who sees demand as an expression of willingness to pay, views water solely as a commodity. If water is purely seen as a social good than demand becomes ‘the expression of expectation of delivery of a right’ (WaterAid 1999). Overall it seems that most practitioners view demand as having both economic and social components, and agree that by responding to demand, projects have an increased chance of sustainability (Deverill, 2000a).

Sara (1999a) describes the demand responsive approach as an approach that attempts to respond to a clearly expressed demand for a service. This demand is backed up by a willingness to pay for a chosen level of service. Deverill (2000b) argues that this expressed demand does not necessarily need to be backed up by a willingness to pay, but could also be backed up by any other meaningful contribution such as time, labour or materials as a financial contribution is not the only indicator of demand.

The definition of demand responsiveness used in this study is the response to a felt need expressed by people for the service they are willing and able to support with a meaningful contribution (Deverill, 2000b). This definition captures willingness-to-pay but does not exclude other meaningful contributions, which could be appropriate in individual situations.

This definition must be backed up with three important caveats (Deverill, 2000b);

1. People must be informed of the benefits, costs and risks of any proposed improvements. Any new option will inevitably be compared to one (or many) already in use.

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- People have to be able to re-assess the relative costs, benefits and risk factors involved in the new option(s), and on the basis of this, make a decision. To do this they must be adequately informed of the costs, benefits and associated risks of what is being offered, in a way that allows a comparison to be made with the existing system.
2. People must be willing and able to express their demands, both individually and collectively. In many situations, marginalised groups within communities may need to be empowered and their individual and collective capacity built before this can occur.
 3. A meaningful contribution (whether it is money, time, labour or materials) is one that empowers consumers. Unlike beneficiaries, consumers have rights over what is delivered and how.

The definition reflects the fact that demand is associated with people exercising a choice. Consumers weigh up their perceptions of relative costs, benefits and risks and choose accordingly. Knowledge, experience, culture and habit alter perceptions.

2.3 DRA and Pricing

What people are willing and able to contribute, expressed in financial terms, may be less than the economic or financial costs of the service being provided. In other words, a project could be demand responsive without being financially sustainable. In practice it has often been demonstrated that many consumers are prepared to meet recurrent costs and a proportion of costs for a service which meets their perceived needs (Deverill, 2000b). Responding to demand can provide significant opportunities for projects to approach full cost recovery. It therefore makes sense to assess demand before introducing a subsidy which may itself be difficult to administer or sustain. In practice, the need for consumers to fund recurrent costs and a proportion of capital and replacement costs is often imposed by necessity and/or government policy. Full cost recovery is not the goal of being demand responsive, but in financial terms ensures that the service provided can be sustained. It may also provide a key incentive for many supply driven institutions and service providers to become more demand responsive (Deverill, 2000b).

2.4 DRA and Demand assessment

The requisite of DRA is that the consumers decide for themselves what is the most practical option to meet their needs. In order to be able to take these decisions the available options should be discussed and analysed. Demand needs to be assessed in order to appraise and finance projects (WELL, 1998). In order to assess demand the factors determining demand must be understood. Demand is influenced by the following factors (Webster (1998) adapted from World Bank):

- 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 and reliability);
- households' attitudes towards government policy and the water service provider.

In these factors the ability to pay, the willingness to pay (WTP) or contribute, and perceptions of payment and contributions are captured.

2.4.1 Demand assessment techniques

Different techniques have been developed in order to assess demand. Demand assessment can be broadly categorised into two methods (adapted from Webster, 1998):

- direct methods (stated preferences): where people are actually asked what they are willing to pay or to contribute for an improved supply;
- indirect methods (revealed preferences); where consumer behaviour is predicted through other means.

The three main techniques are contingent valuation methodologies (CVM), revealed preference (RP) and a combination of various participatory techniques. Table 2.1 shows the demand assessment techniques as adapted from Parry Jones (1999).

That demand assessment can have a much wider application than just measuring willingness to pay can be learnt from a study in Southern Asia (UNDP- World Bank, 1997). The information gathered could also be used to:

- highlight people's perceptions of their current service, how it is delivered, satisfaction levels and the service required;
- highlight gender concerns and the high cost of the coping strategy of the poor;
- design acceptable cost recovery systems based on household cash flow;
- establish acceptable tariffs that include elements of cross subsidisation;
- anticipate future demand for higher level of service through incremental development;
- establish baseline data for future monitoring.

2.4.2 Informing of demand

The CVM and RP demand assessment techniques have the capacity for new projects, to give potential consumers information about characteristics, benefits and costs of different services and delivery options so that an informed choice can be made (Deverill, 2000a). Deverill continues that demand can be informed in the following ways, including:

- explanation of each option to each householder;
- the use of photographs, models;
- visit to other projects;
- water ladder (this is a tool from PHAST (Participatory, Health and Sanitation Transformation)) or other participatory tools and drawings.

2.5 DRA and Engineers

Mvula Trust (1999) states that 'DRA is a radically different approach to rural water and sanitation delivery in relation to what was done in the past. It requires a new way of designing programmes in order to pay closer attention to the correct incentive structure that will elicit appropriate responses from a wide range of stakeholders'. The report continues that careful attention needs to be paid to the design of appropriate institutional and financial options, and to mechanisms for channeling information to communities and other stakeholders. Although this approach affects many stakeholders in the water

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Table 2.1. Demand Assessment Techniques			
Characteristics	CVM	RP	Participatory Techniques
Methodology	Detailed questionnaire to establish WTP or other possible contributions for number of options	Detailed survey of existing behaviour (e.g. associated with water vendors)	Group discussions and exercises with trained facilitator
Principal Purposes	Explicit determination of WTP or other contributions for improved systems	Data on current use of existing systems: provides information for planners to guide future investments	Establish local perception and solutions. Can inform external agency and the community itself
Inputs needed	Economist's input to design questionnaire. Trained enumerators	Trained enumerators	Trained facilitator and participative tools
Outputs provided (specifically related to demand)	WTP and contributions for particular options and economic status of respondents	Details of existing use and functioning of services	Dependent on techniques used and ability of facilitator
Use	Urban/peri-urban water and sanitation projects (Rural will be expensive)	Most often for urban and peri-urban water projects	Smaller scale rural water and sanitation projects
Disadvantages	High cost of specialised inputs. Data rarely gender disaggregated	Does not establish willingness to pay (or contribute) to potential options	Result can be biased, needs a very well trained facilitator
Compatibility	CVM determines maximum WTP and contributions and is theoretically difficult to match with the WTP and contributions for a particular option deduced through a participatory exercise. However, both CVM and participatory approaches can use RP surveys to support data.		

service delivery sector, at community level the engineer plays a vital role in ensuring that communities make informed choices and indirectly by enhancing sustainability.

Roy (1999) blames the engineers for the unsustainable state of most projects because 'the technologist' has been given a free hand. He argues that technology has replaced common sense and marginalises the knowledge, wisdom and skills of the communities. This is backed up by an evaluation carried out in South Africa (Breslin, 1999) where project steering committees revealed that they are "merely rubber stamps for the engineers" and say that discussions were never entertained on technology choice. There are documented cases where community members even said that they wanted to consider other, more affordable options, but their concerns were not heeded. An example of this is illustrated in box 2.2 'Technology choice vs. affordability'. Estimated household tariffs are often included in the plans for these projects, but few in the community are aware of the financial requirements that "their" scheme needs to remain operational.

Debate about cost recovery and community must be linked to questions about affordability and design. If these are not linked the chances of sustainability decrease. Engineers often put emphasis on adhering to the guidelines of the funding agency rather than on what is affordable and practical to these communities (Breslin, 1999). This is an example of the financing

Box 2.2. 'Technology choice vs. Affordability' (Breslin, 1999)

A recent evaluation in an isolated, impoverished area of South Africa found that a water scheme that had been implemented was clearly unaffordable to the local community. Letters in the project file (from both community members and NGOs operating in the area) state that this scheme could never be sustained, and that alternative systems should be considered. The written response from the funders was clear in that the money needed to be spent on the proposed scheme or the project would lose its funding. The project went ahead.

The engineering firm implementing the scheme did not use the opportunity to creatively drive down the cost of the scheme for the community. Instead, a system was implemented that the engineer themselves conceded was completely unworkable. The scheme now purifies all water, regardless of its proposed use and at a cost that is beyond the economic capacity of the area. A massive government subsidy will be needed to keep the scheme running.

agency seen as the client instead of the actual clients in the form of the community. Communities often end up with over designed and unaffordable systems at local level.

In water supply delivery in the development sector it is unavoidable that engineers have a shift in their role. Sara (1999b) describes this role of a service provider e.g. an engineer, in a demand responsive approach, as a very complex one. Although she describes some of the activities, the paper does not reveal any detail or difficulties of this role. It is often acknowledged that the conventional, first world, urban and conservative designs and construction methods are no longer appropriate and that engineers do not really understand or know the communities or target populations. (Wall (1990), Roy (1999) Kotze (2000)). There is very limited literature available on the detail of this and how the engineers see themselves in this process.

The following section investigates the implications for the engineer from a theoretical perspective. Chapter 5 analyses in depth the role of the engineer from a practical and field perspective by means of interviews with engineers.

2.5.1 Implications for the engineer

There are numerous implications for engineers to adapt to the demand responsive approach. Deverill (2000a) describes the following implications for engineers:

1. Engineers will have to provide households with a range of technical options with their associated lifecycle costs rather than a single solution. This implies the need for technical flexibility and adaptability; these options will include not just levels of service, but also options for how that service will be delivered. In order to do this, engineers will have to be informed on consumer demand. Determining and presenting a number of feasible options (rather than a single option) is likely to require increased engineering inputs, which in turn could increase costs.
2. Engineers must view users as consumers and communities as clients; this implies that there may be two clients if one includes the funding organisation.
3. Engineers will have to communicate directly or indirectly with households rather than focus on committees.
4. Engineers will have to work more closely with social intermediaries and other professionals and be willing to accept non-technical issues in the determination of options.

2.5.2 The role of the engineer in DRA

The role of the engineer in the demand assessment is to provide information to consumers on the options available and to respond to the resulting demand. This is an iterative process often carried out over several stages (Deverill, 2000a).

As part of the demand assessment the engineer needs to inform the households of different technical options, including sources and levels of service, with matching costs, operation, maintenance and management of the options and how the service will be delivered. Practical matters such as availability of spares, and access to providers of certain materials should be discussed. A view of the community as client, non-technical matters, and the community (as a whole) should be taken into account in designing of the options. The households should be informed on benefits and constraints of each option. This could be done through discussions but not solely. Another important method of communication is the use of participatory tools where people discover these benefits and constraints themselves. In order to enable the community to make informed choices, the engineer should learn from the community about what is appropriate for that particular area (Deverill, 2000a).

Engineers should respond to present and future demand in their design and support systems. They have to be sufficiently flexible to accommodate a number of different service levels to match demand. Webster (1998) argues that effectively the project is never complete but a dynamic model that is responsive to changing demands of its consumer.

Communication, consultation, participation and community decision making must be safe guarded throughout the process of informing, assessing and responding to demand. Therefore a close working relationship must exist between different role-players, in particular between the social consultant and the engineer.

2.5.3 Ideal model of engineers in DRA

From the above paragraphs it has become clear that the role of the engineer is different in comparison with the supply driven approach, where the level of service is fixed and the planning and implementation top-down. The role of the engineer needs a shift in order to be able to design to meet the demand. For an engineer to be able to design to meet demand certain characteristics are needed. Design to meet demand is not only dependent on the engineer's characteristics, but also on external factors. Table 2.2 shows the ideal characteristics of an engineer in DRA. Table 2.3 shows the external factors that influence the engineer in DRA and how these factors should be in an ideal situation. These tables are based on the existing literature regarding the role of the engineer and the implications of this role in DRA and the author's opinion. The model of the characteristics of the ideal engineer in DRA does not reflect the engineering knowledge and skills gained from a standard engineering educational background.

It could be argued that some of the issues mentioned in the table are not engineer's issues and that the responsibility should be with other role-players. On many projects the engineer or technical consultant is the lead consultant, and social consultants are there only at certain stages in the project and not throughout the full cycle of the project. Therefore the

THE ROLE OF ENGINEERS IN DRA

Table 2.2. The ideal characteristics of an engineer in DRA

<i>Characteristics</i>	<i>Particulars</i>
Knowledge	<ul style="list-style-type: none"> ■ Sustainability factors in the project ¹ ■ Appropriate technology ² ■ Quality assurance ■ Local materials ■ Community dynamics, economics and other issues ■ Policies and guidelines ■ Participatory approaches (basic understanding)
Skills	<ul style="list-style-type: none"> ■ Technical options <ul style="list-style-type: none"> ■ Ability to translate consumer demand into feasible technical options, including different levels of service, associated costs, operation and maintenance and management ■ Engineer must have technical flexibility and adaptability ■ Communication <ul style="list-style-type: none"> ■ Ability to feed back to and draw on information from the social consultant ■ Ability to present options and facilitate discussion at the right level ■ Ability to communicate with households or other bodies than a village water committee ■ Ability to train the people that run projects, not only to operate but also to set and achieve goals and indicators ■ Ability to be a team-player ■ Ability to step back and let people think for themselves ■ Ability to listen, be open, approachable and flexible
Attitudes	<ul style="list-style-type: none"> ■ Willing to communicate and put trust in a multi disciplinary team especially the social consultant ■ Willing to accept non-technical issues to determine technical issues ■ Willing to accept gender issues as part of the project ■ Willing to accept a poverty focus in the projects ■ Willing to see and respect the community as the client ■ Willing to design for the community as client and take their needs into account instead of designing the best infrastructure ■ Willing to see development as a process not as a business ■ Willing to put emphasis on sustainability issues and instead of infrastructure ■ Willing to adopt participatory approaches ■ Willing to be patient as the process could take longer
Motivation	<ul style="list-style-type: none"> ■ Commitment & dedication to community development

¹ Sustainability factors (social, technical, institutional, financial) as identified by WELL (1998).

² Appropriate technology is a technology that is sustainable. This does not necessarily have to be low cost.

engineer requires understanding of certain skills in order to increase the chance of sustainability on projects.

2.6 Concerns and issues around DRA

Although demand responsiveness is acknowledged as a huge step forward in promoting sustainability, the following specific concerns and issues should be taken into account with the application of this approach.

■ Marginalizing the poor

There is a risk that the poorest of the poor will be further marginalized as a result of the ‘willingness to pay’ principle. No specific guidelines, by the World Bank or others that have adopted this approach have been provided to include the poorest.

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Table 2.3. Factors influencing an engineer in DRA

<i>Factors influencing</i>	<i>Particulars</i>
Policy, standards and regulations	<ul style="list-style-type: none"> ■ Policy around water service delivery should create an enabling environment for implementation of DRA ■ Acceptance of multi-disciplinary team
Funding	<ul style="list-style-type: none"> ■ Funding should provide for the whole DRA process
Targets and Dead-lines	<ul style="list-style-type: none"> ■ Cash flow should allow DRA instead of being focused on meeting targets
Political issues	<ul style="list-style-type: none"> ■ Political will should allow DRA in order to enhance sustainability above infrastructure service delivery ■ Community expectations of service delivery
Social Consultants	<ul style="list-style-type: none"> ■ Professional knowledge, skills and attitudes ■ Must be willing to work as part of a multi disciplinary team
Multi-disciplinary teams	<ul style="list-style-type: none"> ■ DRA should be integrated into the whole team
Contracts	<ul style="list-style-type: none"> ■ Contracts should be clear on budget, and on roles and responsibilities of different stakeholders

Also the poor were not always presented with a choice of options due to the failure of engineers to come up with a low cost solutions that meet their demands. A further study by Deverill (2000a) shows that this issue is often overlooked and that clear measures need to be taken to ensure inclusion of the poorest in the projects.

■ **Water as an economic and as a social good**

Water is an economic and a social good but water as a social good should not been seconded to water as an economic good (DRA conference, 1999). What this means in practical and applied terms do not seem clear, but social benefits of improved water supply should not be overlooked. Therefore if DRA is to be adopted then strong regulation should exist to ensure that the social good of water is protected (Webster, 1998)

■ **Institutional reform**

It is also recognised that DRA is tied closely to institutional reform (DRA Conference, 1999). DRA requires more than an active, empowered and organized community. In order for DRA to work it must be accompanied by institutional reform and organisational change at all levels. DRA can gain momentum if policies, attitudes and skills are in place, at different levels, to support the approach.

■ **Isolation of the approach**

Sustainability is not a mathematical function of DRA because sustainability is not the direct result of ‘willingness to pay’ (Adamsen, 2000). A global study from the World Bank (1998) revealed that indeed sustainability was markedly higher in communities where the approach had been used than in those where it had not. However training, education, the presence of some sort of community organisation with managerial responsibilities and the quality of construction were just as important in determining the success of the scheme. It can be said that DRA is a means, but not an end in itself.

■ **DRA and meeting targets**

DRA should be seen as a process and not as a prescriptive procedure for water supply. Tension between DRA and the concept of targets in development

programmes can develop, as it is difficult to measure success in DRA interventions (DRA Conference, 1999). DRA does not conform to the principles of a quick service delivery of infrastructure.

■ **Equity and informed decisions**

Sara (1999c) voices the concern of equity and informed decision making as benefits could be hijacked by the elite, poor information flow and distortion of choices, gender issues where women are not consulted, and local government not being included (or being included and not being representative). Another concern raised is about equity between communities, with the better-organised or richer communities able to obtain more benefits than the poor.

■ **Environmental and water resources**

In responding to demand the impact of projects on water resources and environment needs to be considered and managed in order to be sustainable (DRA conference, 1999).

Chapter 3

Present situation in South Africa

3.1 Legal context

In 1995 a Community Water Supply and Sanitation Programme was established under the Department of Water Affairs (DWAF). From here 'service delivery' was prioritised and a far-reaching legislative programme was implemented. In 1996 South Africa adopted a new constitution which redefined the roles and responsibilities of national, provincial and local government. From being a subordinated tier, the local government is now an independent sphere of government.

The Water Services Act (Act 108 of 1997) made local government councils responsible for the provision of water. The overall objective of this Act is to assist municipalities in their function of water services provision to ensure effective, efficient, affordable and equitable access to water services for all people. The Water Services Act provides a developmental regulatory framework for water services delivery by defining the roles and responsibilities of water service institutions. It allows for the setting of norms and standards for water services in the country. It defines the regulatory and intervention functions of municipalities, DWAF and provinces (Maru A Pula, 2000). The act intends to create an enabling legal environment for municipalities and local government to outsource the delivery and management of services to third parties such as private companies, NGOs, Public utilities or local committees. The local government will then be the Water Service Authority (WSA), i.e. any municipality responsible for ensuring access to water services, and the third party will be the Water Service Provider (WSP), this means any person or institution that provides water services to customers or another water institution. This partnership is formalised through various service agreements and or contracts.

The White Paper on Water and Sanitation, (DWAF, 1997a) proposes that the national government (DWAF) plays a more facilitative role through creating the enabling policy and, legal and financial environment. DWAF will remain responsible for water resource management and will also be the regulator of water service delivery. If local government fails, the Minister of Water Affairs will interfere. It is also responsible for water resources management. But in the meantime, DWAF remains largely responsible for the water supply programmes, due to lack of capacity in local government. Together with

other departments, DWAF has initiated a hand-over phase, expected to take at least five years, during which the responsibility and funding for the provision of basic services, is transferred to district councils (Mvula, 2000).

To date DWAF has subsidised the capital cost of many water supply projects and in terms of current policy communities are expected to finance the maintenance and operation cost of these through cost recovery mechanisms. However payment for water services is extremely low DWAF (1998) estimated the cost recovery in 1997 at 1 per cent. As a result, subsidies for operation and maintenance support have, in many cases, kept the project running (Breslin and Netshiswinzhe, 1998). Subsidising project running costs, besides being contrary to government policy, utilises funding required for capital works to supply the as yet unserved (DWAF, 1998). This year (2000), no DWAF funding has been granted for the initiation of new projects as the funding has been limited to the completion of existing projects and to return to old projects in order to ensure their sustainability.

From the 2000–2001 financial year, the operating subsidies will be integrated into what is termed ‘the equitable share’ (DOF, 1998). The ‘equitable share’ refers to a financial allocation made directly to local government, specifically for the purposes of subsidising operation and maintenance in indigent communities (Jeenes, 2000). There is widespread acknowledgement that ‘the equitable share’ is not being used correctly. The Division of Revenue Act (DOF, 2000) determines how much money is allocated to the ‘equitable share’. It allocates money to national, provincial and local levels of local government. An important aspect of the act is that the spending of funds will no longer be determined by national government, but by local government. The act emphasises that every project considered for funding must clearly demonstrate financial sustainability, including tariff and affordability of this tariff. It has a general comment that the application of design standard must be flexible where appropriate.

3.2 Policy context

DWAF has been responsible for formulating a national policy for water provision in South Africa. The basis of government policy regarding water services as set out in the November 1994 White Paper on Water Supply and Sanitation Policy is that water services provision should be a locally driven process which involves the community and all stakeholders in the process.

The White Paper (DWAF, 1997a) states the following key policy principles:

- development should be demand driven and community based;
- basic services are a human right (however they do not imply the right of an individual person or community to demand services at the expense of others);
- ‘Some for all’ rather than ‘all for some’;
- equitable regional allocation of development resources;
- water has an economic value;
- the user pays;
- development should be integrated;
- environmental integrity should be maintained.

The White Paper also sets a standard to ensure that all South Africans have access to a 'basic level of service'. This 'level of service' is based on the short-term standard set by the Reconstruction and Development Programme (RDP). It is defined as a potable water supply of 25 litres/capita/day (l/c/d) within 200m distance from each household. DWAF subsidises the capital cost of supplying this basic service. A key principle is that service should be provided and paid for in a manner that does not require ongoing government funds to keep the service running.

The policy principles are in accord with international good practice and could be reflected in a demand responsive approach. Palmer Development Group (PDG) (1998) questions whether these policies are implemented in practice and Mvula Trust (1998a) adds that the principles of 'development should be demand driven' and 'the user pays' are ideals but are not necessarily adhered to.

3.3 Current approaches and DRA in the South African context

Literature on South African practices (PDG (1998), Breslin and Nethishiswinzhe, (1998)), shows that despite the international consensus on the value of DRA over supply driven approaches, the reality is that most development work remains top down and externally and supply driven. Beside DWAF, other main role-players in financing and implementing projects are Local Government, BoTT (Build operate Train Transfer) and the Mvula Trust. The approaches of each are described below:

3.3.1 DWAF

Projects currently implemented by DWAF seem to be unsustainable (DWAF, 1998). Webster (1998) states that this is because the approach of planning and implementation of the projects is '*supply driven*'. This means that the projects focus on a service based on assumptions regarding need. Projects are designed on the "basic level of service" and do not take into account individual needs. This means that the standard of service could be too high and too expensive or too low and rejected (PDG, 1998, Mvula Trust, 1998).

Some of the key problems, as identified by Webster (1998,19), of a supply driven approach within the perspectives used for sustainability are:

- technical: design is based on the assumption that all residents will be willing to pay for a new supply at a fixed level of service;
- economic: water supply is seen as having a purely social value (as opposed to economic) and is the responsibility of government;
- institutional: a centralised 'top down' approach is used and responsibilities are not clear.

Democratic participation is seen as a crucial factor in the South African's constitution in implementation of projects (SA Constitution, 1996). The constitution mentions community involvement and people's empowerment. It is questionable what is meant and understood by these terms as they have not been implemented (Rall, 2000). DWAF's 'Sustainable Management Guidelines' (DWAF, 1998) show the importance of community based projects and participation for sustainability of projects. Participation is envisaged throughout the document. But what is the meaning of participation, and the policy principle of demand driven, if

in practice 'area plans' with government and consultants are developed. To some, participation might not mean more than consultation, with communities being informed of the decision taken on their behalf (Breslin and Nethishiswinzhe, 1998).

DWAF has realised that their supply driven approach does not deliver sustainable projects. Initiatives have been taken within DWAF to focus on sustainability factors. They have developed an institutional and social development (ISD) package that focuses on sustainability issues. This package is meant as a guide for ISD issues to implementers, like social consultants and engineers. DRA has been described and advocated in the package and the document argues that DRA should be integrated in their current approach. However, lower appropriate technologies and the ability for communities to operate, maintain and manage their own services have limited consideration. The ISD package (DWAF, 1999) states: 'Often the infrastructure needed is relatively complex, there is generally too little money available to people to pay the full costs of the service and, in many cases, the ongoing operation of the service requires specialised organisations with long term stability. All of these factors imply a role for government at all levels to assist with finance, infrastructure planning and ongoing management.' Although this document also argues that 'individual households (customers) have a primary role to play both in the decision making with regard to services, in the payment for these services, and in working together as a community in the actual provision of the services', in principle, this supply driven approach is still a supply driven.

3.3.2 Local Government

The general approach of local government is based on expensive urban models and is a top-down and supply driven. The role of the communities and non-governmental organisations (NGOs) in general is not valued (Rall, 2000). Local governments have adopted the policy and procedures of prioritising and implementing water projects as used by DWAF (Thomson, 2000). This has been the traditional DWAF role.

3.3.3 BoTT

Build operate Train Transfer (BoTT) is a contract, under DWAF and based on its policy principles, that has been designed to facilitate a turnkey approach to the implementation of water services. The contract is to implement water projects within a short timeframe. The projects include the institutional and social development aspect, the design and construction as well as operation, maintenance and monitoring. The contract is managed as a public/private partnership (Ive, 1999). BoTT fast tracks the implementation of the water projects and bypasses the bureaucratic procedures within the DWAF projects.

In BoTT it is also recognised that a participatory approach should be taken and that the community must be in the driver's seat, and lead and participate in the construction process (Wadall, 2000). To achieve this there is a focus on "institutional and social development (ISD)" in the projects. Although ISD is an important factor, the focus on a single water committee, a speedy delivery, limited choice of and quite high-tech technology, still means that there is not much scope for real participation and consideration of consumer demand. Hemson (2000), who evaluated BoTT, states that BoTT has large, expensive, highly engineered projects based on municipal systems. Community involvement is very little both on design and implementation and no account is taken of demand, except that people want water.

3.3.4 Mvula Trust

The Mvula Trust was established with a set of policies and procedures designed to put the demand responsive approach into practice with the objective of promoting sustainable rural water supplies. The original policies included (Rall, 1999):

1. Support given in response to community applications. (This is no longer possible because of prioritising of projects by local government.)
2. Full legal backing and authority given to the elected water committees to manage their own funds (with exclusive control over their own bank accounts through which all project funds are channeled), appointment of technical and social consultant to provide support, management of procurement, hiring of labour, etc.
3. Community selects technology.
4. Eight per cent community contribution to capital costs (note: this was later changed, communities are no longer required to pay for capital costs. Instead, they now collect what is called the 'emergency fund'. This fund should be sufficient, by the end of the project, to cover the potentially high cost of an unexpected breakdown, which may later occur.
5. Community 'ownership' and management of schemes.
6. Full cost recovery from consumers for direct operation and maintenance cost.
7. Mvula social science and technical field staff play a facilitating role.

Evaluations (Breslin (1999), Palmer (1998)) and field experience have demonstrated the relative advantages of the Mvula approach over other approaches currently being employed in South Africa. Unsuccessful projects were mostly caused by poor implementation of policies rather than inappropriate policies. It has also become clear that Mvula's policies and procedures have not adequately ensured that DRA principles are adhered to, and that this failure has been the cause of many identified shortcomings. A widely recognised problem is that the monitoring and evaluation on projects has been insufficient, and major problems were not identified until relatively recently (Mvula Trust, 1999). Other problems of the original model include (Jeenes, 2000):

- not enough time was spent on projects;
- training was too short and not always appropriate and effective;
- committees were often not able to effectively take on the project management role, later it was realised that project management was not regarded and understood as important by the committees;
- Mvula Trust assumed that committees were accountable to the broader community and had direct contact with the community, and;
- the consulting engineer could not be properly/effectively managed by committee and therefore, very often, did very poor work.

To address these problems Mvula Trust has developed a 'new model' for implementing projects. This model is based on Mvula's interpretation of DRA and on the lessons learnt over the years. Unfortunately, it is not yet widely implemented on new projects due to the lack of funding for new projects. However, it has been partially implemented in a few isolated projects.

3.4 Role of the engineer at present

This paragraph establishes the role of the engineers in DWAF and Mvula Trust projects. For the sake of simplicity engineers in Local Government and BoTT are assumed to have a similar role to the engineers in DWAF, as they generally have a similar supply driven approach. The roles and responsibilities to implement a project are based on appointment letters from DWAF in 1996. The more recent developed ISD Package (DWAF, 1999) includes roles of technical and social consultants but does not describe these roles. There are guidelines on how some things should be done, but not stated by whom. This package includes instructions for the consultants, but these do not contain any information as these instructions are regarded as confidential.

This paragraph describes the role of engineers that are contracted to work on DWAF or Mvula Trust projects and the role of engineers working within these organisations. The external (contracted) engineers are described as consulting engineers, the internal engineer within Mvula Trust is called the regional engineer and DWAF has internal design, construction, specialist and water services engineers. These different 'types' of engineers have been described to give an overview and understanding of their specific roles and responsibilities within the water service delivery. In the rest of this document no distinction has been made between these 'types' of engineers, as they are all trained or professionally engaged as engineers in the water supply delivery.

3.4.1 Role of consulting engineer in DWAF projects

It is the consulting engineers' responsibility to produce a design, based on the RDP basic level of service DWAF (1997b). The design criteria include:

- a minimum quantity of potable water of 25 l/c/d, upgradable to 60 l/c/d;
- maximum walking distance 200 metres;
- minimum flow rate of not less than 10 litres per minute;
- availability on a regular, daily basis; supplied from a source of raw water which is available 98 per cent of the time/not failing more than one year in 50 years and with the effectiveness of not more than a week's interruption in supply per year.

The consulting engineer's role and responsibilities in the implementation of a project are (DWAF, 1996):

- to liaise with the various committees, if the project is large and more than one community is involved, in order for their most pressing water needs to be established and dealt with in order of priority;
- to plan the scheme in close co-operation with community (community participation);
- to prepare a preliminary design to standards as set out in the White Paper on Water Supply and Sanitation Policy (feasibility study);
- to prepare a final design and detailed cost estimate (Business plan);
- to prepare tender documents, call for tenders, evaluate tenders;
- to manage the execution of the schemes;
- to train nominees of the communities in skills of managing, operating and maintaining of the scheme.

The consulting engineer has to draw the design and phrase specifications for the civil construction work in such a manner that maximum advantage can be taken of labour intensive construction methods. Specifications and tender documents for civil construction will be drawn up and phrased in such manner that local contractors will be placed in a position that they can offer their services.

The consulting engineer in DWAF projects has a contract directly with DWAF and is contractually not linked with the community.

3.4.1.1 The role of the consulting engineer and community participation

Although community participation is stated, it is not clear to what level the engineer has to involve the community. The community participation viewed in the roles and responsibilities of the engineers at present could be seen as a 'cheap labour' concept of participation. The 'cheap labour' concept of participation considers the community to have participated when it provides free, unskilled labour for construction and donates raw materials 'in the spirit of self-help' (Snel and Smout, 1999).

At present a certain level of community involvement and agreement with the plan of the proposed water service delivery is shown through a committee signature on the business plan.

3.4.2 The engineer within DWAF

Within DWAF there are extremely varied roles played by engineers (Sussens, 2000). Firstly there is the traditional design engineer (civil mostly but also mechanical and electrical. These engineers do the actual design work themselves – canals, dams, pipelines, drains etc. This work has reduced considerably as the focus is now on water services to the poor.

Secondly there are the construction engineers. They are either at head office doing overall management of a number of projects or on site doing actual construction. This function too is now vastly reduced.

Thirdly there are engineers in the water services sector. These are engineers in name only and are more managers than engineer. They do mainly management of consulting engineers, drafting of policy, programme management and administrative tasks.

Within DWAF there are also specialist engineers such as: dam safety specialists, environmental engineers, contract specialists, etc.

In general the external consulting engineers are responsible for the liaison, design and implementation of the water supply projects for DWAF projects and the engineers within DWAF monitor these engineers.

3.4.3 The consulting engineer in Mvula Trust projects

The consulting engineer in Mvula Trust projects is called a Project Agent. The project agent (PA) has a contract with the committee instead of a contract directly with the Mvula Trust. The role of the project agent is to ensure that all technical aspects of the project are addressed and that simultaneous capacity building of the committee takes

place. In practice, the PA is the overall *project* manager for the scheme, and is responsible for guiding the committee through the stages of design, planning, budgeting, construction and commissioning (Mvula Trust, 1997).

The general responsibilities of the PA includes (Mvula Trust, 1997):

- to prepare a feasibility report in consultation with the committee;
- to prepare the necessary designs and working drawing;
- to prepare a detailed materials list, schedules of labour requirements, and a project planning report;
- to assist the committee in evaluating material quotations, and in managing the ordering, delivery and storage of materials and tools;
- to provide the committee with all the necessary technical and management advice necessary for successful project implementation. This support must continue until project completion, and include monitoring of progress, fund allocation and quality control;
- to assist the committee in maintaining appropriate financial and administrative procedures, through up to date bookkeeping and record keeping;
- to assist the committee in preparing disbursement requests;
- to provide post project technical support, if required.

By the end of the project, most of the PA's project implementation skills should have been transferred to the committee and to those members of the community who will operate and maintain the scheme. In this way capacity will have been built. However, this has generally not been successful (Jeenes, 2000).

The responsibilities of the PA are defined in the contract with the committee. At the moment contracts are more customised for particular projects and in some cases there is a contract between the PA and the Mvula Trust (Macdonell, 2000). The role and responsibilities of the PA will be revised as per 'new model' (see para.3.3.4), but at present most projects are still being implemented as outlined in this paragraph.

3.4.4 The engineer within Mvula Trust

The engineer within the Mvula Trust is called a regional engineer. The regional engineer is responsible for technical aspects of community water supply. Together with the Mvula's Project Development Facilitator (PDF), who is responsible for the social aspects, the engineer is involved in the assessment of project appraisals, feasibility studies, the capacity of role-players, the appropriateness of training and systems, conflict management and facilitation, facilitation between Mvula Head Office and communities, monitoring and evaluation, and the general guidance to the role-players with regard to Mvula policy and guidelines (HSRC, 1999).

3.5 Role of the social consultant and training agent at present

This paragraph outlines the role of the social consultants (DWAF) and training agents (Mvula Trust). The social consultants and training agents play (or should play) a significant role in the implementation of water projects in the South African context.

Their roles have been described in order to gain a better understanding of the implementation situation in South Africa.

3.5.1 The role of the social consultant in DWAF

The role of the social consultant is to ensure institutional and social development in the projects. Terms of references (DWAF, 1998) outline the role and responsibilities of the social consultant as capacity building and training, but do not clearly define them. Roles and responsibilities as outlined in the terms of references for social consultants include:

- to train committee members to manage their own water supply from planning, design, implementation to the completion of the project up to operation and maintenance;
- the training should predominantly focus on the committees;
- to create a sense of ownership in community;
- to encourage ethos of payment for their services;
- to develop institutions;
- the training should include technical skills as well as general community awareness;
- to capacity build the community through labour intensive construction, basic principles of business and construction management;
- to focus on women.

3.5.2 The role of the training agent in Mvula Trust

Training agents (TA's) are responsible for ensuring that appropriate training is carried out for the effective implementation and the long-term sustainability of the project. The TA responsibilities include (Mvula Trust, 1997):

- to work in close co-ordination with the PA;
- to obtain a written motivation from the community for appointment as the Training Agent;
- to carry out a detailed Training Needs Assessment;
- to prepare a coherent training package relevant to the detailed needs assessment;
- to train the committee on the Mvula Trust's financial procedures, starting with the financial questionnaire;
- to carry out institution building training, financial training and the management component of O&M training;
- to assist with disbursement requests;
- to provide financial management support as part of training follow-up activities;
- to provide or facilitate health and hygiene training;
- to provide regular follow up services for at least six months after initial training.

The original name of Training Agent has been changed to Institutional Social Development (ISD) consultant. The role and responsibilities of the ISD consultant will be revised as per 'new model' (see para.3.3.4), but at present most projects are still being implemented as outlined in this paragraph.

In the rest of this document the ISD Consultants will be referred to as social consultants.

Chapter 4

Research methodology

In this research project the following hypothesis is tested (box 4.1):

“The adoption of the demand responsive approach in the water service delivery sector in South Africa requires a shift in role and characteristics of the engineer.”

4.1 Data collection method

The aim (see para.1.3) of this research has been investigated through:

I Literature review of existing documentation

A review of external data has been carried out. This review looked at data directly relevant to DRA and at appropriate information relating to the role of, and impacts on, engineers and other role-players. The review has also contributed to table 2.2 which illustrates the ideal characteristics of an engineer in DRA (see para. 2.4.3) and will be used for analysing the interviews. Data have been obtained from the following sources:

- WEDC Resource Centre, Pilkington library at Loughborough University (books, publications, journals);
- World Wide Web (articles, e-mail discussions, etc.);
- DWAF, Mvula Trust, and other organisations (White Paper, policy documents, reports, evaluations, publications, journals).

II Key informant interviews

Representatives from DWAF, Local Government, Mvula Trust, BoTT, Water Boards and other organisations have been interviewed to gain a full understanding of specific issues such as law, policies, current approaches towards water projects, DRA and the different role-players.

III Semi-structured interviews with engineers

Engineers in developmental projects are required to play a different role than those in first world or urban engineering (Breslin (1999, Kotze (2000)). Often engineers are accused of not understanding this role and are blamed for failure of projects (Roy, 1999). Investigation into the role of engineers has been carried out through interviews. The aim of the interviews is:

- to establish the current knowledge, attitudes, perceptions, actions and practices of engineers in the rural water supply;
- to gain understanding of issues affecting their role in planning, design and implementation in water projects;
- to establish views and attitudes regarding DRA;
- to hear the engineers, so that their voice can be taken into account when making recommendations in order to improve the chance of success in water service delivery.

Semi-structured in-depth interviews were the most appropriate choice for data collection as they allow enough flexibility to go into detail about various, often unexpected, aspects of the research question (Minichiello, et al, 1995). This enables the collection of a mass of data that might reveal valuable insights. Eighty five per cent of the interviews were taped and transcribed and notes were taken at fifteen percent of the interviews. The sample of engineers include consulting engineers in the private sector and NGO sector and engineers working for DWAF, BOTI, Local Government and Mvula Trust. The sample includes engineers at all levels; design, implementation, project and managerial level.

The questions in the interviews with the engineers evolved around the following:

- attitudes towards water projects;
- how they see their role in water projects;
- factors influencing and affecting their current role;
- appropriate technologies;
- knowledge and skills of engineers regarding different approaches;
- perceived benefits, constraints and implications of DRA, and perceived factors influencing and affecting their role in DRA;
- whether they have had opportunities to learn about their developmental role;
- if they believe in and are willing to adopt a different role;
- communication structures;
- how they could be supported in their responsibilities.

Appendix 4.1 shows an example of the interview structure with the engineers. The structure starts with a closed set of questions and continues in a semi-structured type of interview, where discussion was facilitated by the interviewer around certain topics and questions.

The interviews with the engineers are central to this research and carry the highest level of importance throughout the research.

IV Semi-structured interviews with project development facilitators and social consultants

Project development facilitators (PDFs) from the Mvula Trust have been interviewed as they work closely together with Mvula Trust engineers and monitor the work of engineers and social consultants in rural water supply projects. PDFs are familiar with the DRA concept and are a useful source of information regarding the change in role of engineers because of DRA. The aim of these interviews has been to provide information on the perceived role of engineers from an external point of view.

Social consultants have been interviewed to gain an understanding of their role and how they perceive their relationship with the engineers.

The interviews with the PDFs and social consultants have been structured in the same way as the interviews with the engineers and the same topics have been discussed.

4.1.1 Actual interviews

The first interviews held were key informant interviews at national level. The interviews were focused around topics related to DRA, as described in the interview structure, and around current issues affecting the water sector. These interviews indeed provided a good understanding of the South African water sector, issues related to DRA, current issues and yielded useful contacts. The interview structure did not change during the course of the fieldwork. Emphasis on certain topics in the interviews was set by the interviewer, but depended on the organisational background of the interviewee.

The interviews with the engineers were initially carried out as per prepared interview structure. However, the interviewer felt that information requested in the closed questions lost its power, due to the closed structure. The closed structure did not require enough individual input and therefore the closed structure has been integrated into the semi-structured part of the interview. It proved to provide better individual information. This change does not have an effect on the analysis of the interviews.

4.1.2 Profile of respondents

A total of 62 people have been interviewed. The interviews have taken place across the water sector, and included representatives from DWAF, Department of Local Government and Housing (DLGH), Water Sector Support Unit (WSSU), Local Government (District Councils (DC)), a Water Board, BoTT, NGOs, private technical consultants, and private social consultants. Table 4.1 shows a profile of the interviewees.

The interviews have mainly taken place on a one-to-one format. Three interviews were attended by two people and the author, two interviews were held telephonically and two interviews have been informal. Each interview lasted about 45 – 90 minutes.

The fieldwork for this study has been carried out in four different provinces (Gauteng, Northern Province, Kwa Zulu Natal and the Eastern Cape). Interviewees were recruited by the author's personal contacts, with help of national and provincial offices of Mvula Trust and DWAF and through the actual interviews.

4.2 Analysis

To establish credible data analysis the following research designs are applied: analysing data in a descriptive and a comparative manner (Boot and Cairncross, 1993).

4.2.1 The descriptive analysis

The descriptive analysis concerns percentages, simple associations and summary counts. It provides information on where the engineers are at the moment in terms of knowledge, skills, attitudes, perceptions and practices in the current approaches they are taking to rural water supply, and the factors affecting their role and their views on DRA.

In the descriptive analysis distinction is made between:

1. Engineers' current knowledge, skills, attitudes, perceptions, and practices.
 2. Engineers' views on current approaches and funders.
 3. Engineers' views on DRA
 4. Rating of the engineers' attitudes to DRA.
 5. The view of non-engineers on the role of the engineer.
 6. Engineers and non-engineers' view on external factors affecting the engineers' role in DRA.
- as a basis for the in-depth descriptive analysis of current knowledge, skills, attitudes, perceptions and practices of engineers, a table is drawn up that shows analysed typical responses of the engineers in their current approach to DRA related topics. This analysis is based on the interviews with the engineers. This analysis under DRA related headings (topics) enables the researcher to easily translate the findings obtained from this analysis into the comparative analysis;
 - the analysis of the engineers' views on current approaches, at present implemented by different funders is based on the interviews with the engineers;
 - the analysis of the engineers' views on DRA is based on the interviews with the engineers. (An explanation of DRA, as defined by World Bank (see Chapter 2) is given in the interviews to the engineers, in order to establish a common understanding of DRA for the purpose of uniformity.)
 - the rating of the engineers' attitudes is related to 1), 2), and 3) as outlined above. This rating is described in paragraph 4.2.1.1;
 - the analysis of the views of non-engineers on the engineers is based on the interviews of some of the key-informants, project development facilitators and social consultants. This analysis provides a broader view of the role and characteristics of the engineers;
 - the analysis of the engineers and non-engineers' views on external factors affecting the engineers' role in DRA is based on the interviews with all respondents. This analysis contributes to an understanding of external factors affecting a possible adoption to DRA.

In order to be able to analyse the interviews, each interview is broken down into different topics. These topics included DRA related topics, but also approaches, knowledge, skill, attitudes, perceptions and practices.

Quotes from the interviewees are used to illustrate examples. These quotes are not referenced to protect the privacy of the interviewee.

THE ROLE OF ENGINEERS IN DRA

Table 4.1. Profile of interviewees

<i>Type of organisation</i>	<i>Total number of interviewees</i>	<i>Number of engineers interviewed</i>	<i>Number of social consultants, PDFs and ISD interviewees</i>	<i>Number of key informant interviews¹</i>
DWAF	7	3	2	2
DC	4	4		
DLGH	1			1
NGOs	20	9	6	5
BoTT consortia	3	2		1
Water Board	1	1		
WSSU	1	1		
Technical private consultants	21	21		
Social private consultants	3		3	
Durban Westville University	1		1	
Total	62	41 ²	12	8

1 In some cases key informants, were also engineers. These interviews have only been noted under the engineer's interviews.

2 It should be noted that engineers are qualified by knowledge, experience and position and not only by university degree. The 41 engineers interviewed include 1 hydrogeologist, 1 agriculturist and 3 technicians. The sample of engineers include engineers at design, implementation, project management and management level.

It should be noted that because of the open structure of the interviews, the responses are not exactly the same type around the same subject in each interview. In the typical responses, if a certain percentage agreed with something, it does not necessarily mean that others disagreed. It should be noted that interpretation of open answers might vary between different researchers.

4.2.1.1 Engineers' attitudes to DRA

An overall rating will be done to group the engineers in terms of where they stand in their attitudes to adoption of DRA. This rating relates to the analysis of 1) the engineers current knowledge, skills, attitudes, perceptions, and practices, 2) the engineers' views on current approaches and funders and 3) the engineers' views on DRA, as analysed in the descriptive analysis (as outlined in the previous paragraph).

The rating is based on the SARAR (Self-esteem, Associated strengths, Resourcefulness, Action planning and Responsibility) resistance to change continuum (Mvula Trust, 1998b). This tool is useful in assessing the level at which people are in the change continuum. The rating will be analysed and could be used to address certain recommendations. The rating will be presented in percentages in a tabular format. Table 4.2 describes the grouping for the engineers.

Table 4.2. Rating of engineers' attitudes towards DRA

Description
<p>Engineer A believes that there should be community involvement and shared decision-making but also believes that decisions should be based on technical expertise, and therefore the giving of options and decision-making in the project is quite limited.</p> <p>Engineer B believes that there should be community involvement and shared decision making. He/she would like adoption of DRA in order to increase the chance of sustainability. The fear of this engineer is that because of external constraints this adoption is not possible, and therefore he/she does not feel to be able to contribute towards DRA.</p> <p>Engineer C believes that there should be community involvement and informed decision making. He/she would like (partial) adoption of DRA in order to increase the chance of sustainability. The fear of this engineer is that because of external constraints this adoption is not fully possible, but still feels that he/she can play a role in taking up this approach and is therefore willing to learn about his/her role in the approach.</p> <p>Engineer D has taken up demand and informed decision making in the project. The engineer has some knowledge of DRA and is willing to learn further. External factors are affecting, but not determining, the approach taken.</p>

Table 4.3. "where are we" structure

Where are we?	Where do we want to be?	6 How do we get there?
Information from the comparative analysis around the current characteristics of engineers in DRA and external factors affecting the engineers' role.	The ideal characteristics of engineers in DRA and the ideal external factors affecting the engineers' role.	Analysis of the "where are we" and "where we want to be" provides the gap between these two. The "how do we get there" provides the bridge over this gap.

4.2.2 The comparative analysis

The comparative analysis involves comparison between sets of variables. The analysis is between collected data and the ideal characteristics of engineers in DRA (see para.2.4.3) and the ideal external factors affecting the engineers' role in DRA (see para.2.4.3).

The comparative analysis is based on findings in the descriptive analysis and on the interviews with the engineers and data collected describing external factors affecting the role of the engineer.

This analysis provides information for a 'where are we' structure that answers the following questions: Where are we? Where do we want to be? How do we get there? Table 4.3 describes this structure. The 'where are we' is the interpretation of the analysis and this will be presented in the conclusions. The 'how do we get there' are the recommendations based on the conclusions.

4.2.3 Discussion of analysis

The findings of the descriptive and comparative analysis will be discussed in the final step in the analysis. Where appropriate the findings from the interviews will be linked back to existing literature.

The analysis of the interviews is presented in Chapter 5.

Chapter 5

Analysis of interviews

This chapter presents the findings of the surveys undertaken among engineers (and a small sample of other water practitioners) in South Africa. These findings are based on interviews and are subjected to descriptive and comparative analyses as outlined in the methodology (see Chapter 4).

This chapter is structured as follows:

1. paragraph 5.1 describes the descriptive analysis. This includes:
 - engineers' current knowledge, skills, attitudes, perceptions, and practices;
 - engineers' views on current approaches and funders;
 - engineers' views on DRA;
 - rating of the engineers;
 - view of non-engineers on the role of the engineer;
 - engineers and non-engineers' view on external factors affecting the engineers' role in DRA.
2. paragraph 5.2 describes the comparative analysis. This includes the tabular comparison between the ideal and existing characteristics of the engineer and the ideal and existing factors affecting the adoption of DRA.
3. paragraph 5.3 describes the discussion of the analysis.

5.1 Descriptive analyses

5.1.1 Engineers' current knowledge, skills, attitudes, perceptions and practices

The analysis of the 'engineer's current knowledge, skills, attitudes, perception and practices' is based on the interviews solely with engineers and described in this paragraph.

5.1.1.1 Typical responses of engineers

Typical responses from the engineer are described in a tabular format (table 5.1) and this provides a basis for the descriptive analysis. Although these typical responses are analysed in DRA related topics, it should be noted that these responses relate to current thinking and implementation of all rural water supply projects. If no percentage (of

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typical responses) is given in table 5.1, it can be assumed that there is general consensus on the statement provided.

Table 5.1. Typical responses	
Appropriate technology	<ul style="list-style-type: none"> ■ About 50% of the engineers see appropriate technologies as hand pumps, windmills, rainwater collection methods, use of springs, etc. ■ About 40% of the engineers see the appropriate level as the lowest level of service possible on a reticulated system. ■ About 10% of the engineers have never heard of appropriate technologies.
Community dynamics and understanding	<ul style="list-style-type: none"> ■ 80% of the engineers claim to know the communities because of their experience or upbringing.
Options	<p>Technical choices</p> <ul style="list-style-type: none"> ■ Different designs of tapstands are offered. ■ Labour rotations, payment around labour, etc. ■ A small percentage stated that it is very difficult to give any options. <p>Changes in design because of feed back from the community</p> <ul style="list-style-type: none"> ■ Changes in design are made concerning the position of pipes, tapstands and reservoir. <p>Levels of Service</p> <ul style="list-style-type: none"> ■ 90% of engineers have never designed for mixed or higher levels of service.
Willingness to Pay (WTP) and/or Willingness to make other Meaningful Contribution (WTMC)	<ul style="list-style-type: none"> ■ over 75% of the engineers have never heard of WTP ■ WTP and/or WTMC are not properly established. ■ WTP and/or WTMC has not had any input in design.
Participation and decision taking	<ul style="list-style-type: none"> ■ 75% of the engineers see participation as merely discussions with the project steering committee and the telling/discussing of the best option. ■ Community participation happens in mass meetings. ■ Decision taking by the consumers is an important process in the project. ■ 50% of those interviewed said that the process of decision making gets hi-jacked by the local government.
Participatory approaches like PRA (Participatory Rural Appraisal) or PHAST (Participatory Health and Sanitation Transformation)	<ul style="list-style-type: none"> ■ 65% of engineers have not heard of participatory approaches or do not know exactly what they are. ■ 85% felt that the engineers should be aware of the participatory approaches so that they could become involved. They did not feel that it was the responsibility of the engineer to carry out such approaches in the field. ■ About 15% felt that a formal participatory methodology would do exactly the same as discussions. ■ Less than 10% have used a participatory methodology in sanitation projects.
Communication	<p>Presentation of technical designs:</p> <ul style="list-style-type: none"> ■ Showing advantages and disadvantages to the committee on paper. ■ Not clear how design is communicated from the committee to a wider community apart from holding a mass meeting. <p>Communication with social consultant:</p> <ul style="list-style-type: none"> ■ Social information does not feed back into design, operation & maintenance and management. ■ It is recognised that social and technical consultants should communicate much more and be able to correct one another. <p>Communication with bodies other than committees:</p> <ul style="list-style-type: none"> ■ 95% of the engineers communicate directly with the project water committee, often mostly focused on the person who is leading the project. <p>Communication between design engineer and implementing engineer:</p> <ul style="list-style-type: none"> ■ A small percentage of engineers said that there is a big gap between the design engineers and the implementing engineers.

continued . . .

Table 5.1. Typical responses Table 5.1 (cont.)

Training	<ul style="list-style-type: none"> ■ On the job training is provided for operation, maintenance and management of the scheme.
Social Consultants (SC)	<p>90% of the engineers have a problem with social consultants.</p> <p>The main issues mentioned are:</p> <ul style="list-style-type: none"> ■ SC do not understand the projects. ■ SC are only interested in problems, to earn more money and are not dedicated to their jobs. ■ SC do not have proper training, and can just call themselves a sc. ■ SC cannot facilitate. ■ SC do not have any technical understanding. ■ SC should not take decisions without involvement of engineers. ■ SC do not know what their responsibilities are.
Non-technical issues	<ul style="list-style-type: none"> ■ 80% of engineers felt that non-technical issues (like social issues) are important for implementation of the project but such non-technical issues do not get fed back into the design.
Gender	<ul style="list-style-type: none"> ■ Women take the best decisions, are more dedicated and reliable. ■ Women are always involved because of policy rules.
Poor	<ul style="list-style-type: none"> ■ Poorest are not considered in planning, designing and implementation of a water project.
Client	<ul style="list-style-type: none"> ■ 50% of engineers regard the funder as the client. ■ 50% of engineers regard the community as the client.

5.1.1.2 Descriptive analysis of the engineer’s current knowledge, skills, attitudes, perceptions and practices

The descriptive analysis:

A) Engineers and appropriate technologies

There are different views of low-cost appropriate technologies among engineers. Few of the engineers interviewed (3) have ever designed using a technology of rainwater harvesting, handpump scheme, shallow wells, etc. About 50 per cent of the engineers feel that they should be able to offer appropriate technology in order to create more sustainable projects. A small percentage of the engineers are not interested in low-cost appropriate technologies as they regard them as non-infrastructural projects with design that is too basic.

Appropriate technology is often seen as low-cost and not as a sustainable technology. Low-cost appropriate technology has often been mentioned in the interviews as politically unacceptable. The politicians would not promote these technologies, because they want to be seen as addressing the people’s needs by implementing reticulated infrastructure. It was also felt that communities themselves would not be interested in a lower technology, even if it meant that the project would be more affordable or manageable, because of the political promises.

The lowest appropriate technology level for about 40 per cent of the engineers is a reticulated system with standpipes. That this lowest level does not depend on the individual community and that appropriate technology means different things to different people can be learned from the following quote ‘We know what is the appropriate level of technology by experience. This is an infrastructure design of 460 Rand (\$67) per person and this figure is based on our experience. If other consultancies design for us, we already know what is possible and appropriate. This is how we enforce appropriate technology’.

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Appropriate technology is not an issue that most of the engineers have to take into account at the moment. The main issue of designing is whether or not the design of the infrastructure is within budget. Designing to fit the budget does not take into account the operation, maintenance and management.

B) Engineers and community dynamics

All engineers agree that community dynamics is an important factor in the implementation and sustainability of a project. It is felt that community dynamics should be understood by both the engineers and the social consultants. Most engineers feel that they do understand the community dynamics through experience, others (mainly white engineers) are convinced that they understand the communities as they have been 'born on a farm', have grown up among the communities and find it easy to communicate with them.

The engineers interviewed would almost always argue that many other engineers out in the field do not understand communities and something should be done to assist them. A small percentage of the engineers feel that they do not know the community well enough and believe that real understanding will only come when black engineers become involved in the rural water supply.

As most white engineers live and grew up under very different circumstances from the communities the point of 'completely understanding the community' could be open to argument. That engineers might have a limited knowledge of the communities could contribute to the examples of over design and high cost of operation and maintenance of many projects.

C) Engineers and provision of options

The options given to the community are limited to choices of design and position of tapstands and reservoirs. Options relating to sources of water are dependent on the financial implications of developing the source. Changes are made to the design concerning the position of the tapstands, reservoirs and pipes, when requested by the community and it is technically possible to do so. Five of the engineers interviewed have given more choice around mixed (including appropriate technologies) or higher levels of service. Most engineers have not given options to the community as they build what the funder says in the RDP guidelines. One engineer commented: 'On some of the DWAF projects the design is approved by DWAF before it comes to the community'. Engineers from DWAF argue that the policy does not say that the service is only restricted to standpipes. It is the basic level and communities could have a mixed level of service if they are willing to contribute. This should be explained to the community.

The majority of engineers said that higher levels of service could contribute to an increase in cost recovery and management. From here many people have very many different views on levels of service. The engineers who are not in favour of designing for mixed or higher levels of service argue that such designs are creating problems because of uneven distribution in the community and could divide the community. Also sustainability of the higher level of service is not proven, and that everyone wants the higher level of service but no one looks at affordability. Engineers in favour of mixed or higher levels of service argue that provision of higher levels of service is the only way to go for

cost recovery and sustainability of the projects. Some engineers believe that provision of a higher level of service would not increase cost recovery, as there is not an existing culture of payment for services. They argue that payment does not depend on what kind of service is delivered.

Because of the legal framework, engineers are not feeling encouraged to offer different options and DWAF has only taken limited action to encourage the giving of options. Although engineers blame the RDP standards for not giving options, it is also admitted that giving options creates difficulties in implementation because of decision making within the community ('not everyone agrees and it takes time'). This slows down project implementation and more facilitation is needed. Because of these reasons communities are not actively involved in the planning and design of the projects.

Provision of different options to the communities is restricted at present because of limits of the policies and guidelines, the ease of not providing options in terms of community decision making and because of lack of knowledge on what options to offer.

D) Engineers, willingness to pay and/or making of other meaningful contributions

Willingness to pay is a new concept for 85 per cent of the engineers. Limited surveys (questionnaires) to establish contributions are done at the start of a project, but this information is not fed back into the design. About 50 per cent of the engineers feel that it might be more appropriate to design for what people can afford. At the moment it is often assumed that people can contribute about three per cent of their income to water each month. It was doubted whether it is possible to get reliable results from the willingness to pay/contribute surveys. Engineers working on Mvula Trust projects felt that the only method of willingness to pay/contribute addressed in the projects is the 'emergency fund' or the former 8% community contribution to the Mvula Trust projects (see para.3.3.4). It was felt that other contributions were not assessed but 'dictated' by the funder.

As willingness to pay and/or making of other contributions is often seen as the sole responsibility of the social consultant it could be questioned whether the link between the social and technical side is made.

E) Engineers, participation and shared decision making

The term participation seems to mean different things to different people. For some people it means involving the communities, others see it as a way of communication and see participation as 'communicating from the top level to lower down'. Participation and shared decision-making by the community are, in theory, regarded by most engineers as very important processes in the project. However, many argued that the community should make their decision based on the experience of the engineer. Engineers feel that quality of the infrastructure can decrease because of shared decision taking. Another shared view is that engineers might lead people in the directions the engineer wants, but that the engineer does not formally take the decision. One engineer puts his views as follows: 'People can be involved and participate, but they cannot be allowed to take a technical or financial decision regarding the project as they are non-technical people. We need to convince them that the technical decision we make is right, so that they adopt that decision.'

Engineers who have taken on-board community participation and decision-making are describing external problems in the participation and decision making stage. It was felt that shared decision making could only take place in small projects (between 2000 – 3000 people). The following example has been mentioned a couple of times: “It has been a long process to get people involved and get their ideas about the project, but everything was built up around the community making the decisions, even the local government was on-board. Then elections came along, a new local government person got involved and said that he was in charge and would make decisions. Our effort was wasted and we were in exactly the same position as when we started.”

What participation and shared decision making means in practice is not understood by all engineers. Participation and shared decision making often does not seem to go any further than informing communities of the proposed designs and employing local labour in the construction phase. Attitudes such as ‘we know best’ seem to hinder this process and it is most likely that many decisions are taken by the engineer, although he/she feels that the community has been consulted. Engineers who give communities a voice could experience external difficulties.

F) Engineers and participatory approaches

Although the use of PHAST has been advocated by organisations like the Mvula Trust, the actual knowledge of this approach or other participatory methodologies by engineers is very limited. A large percentage of the engineers would like to have an understanding of participatory approaches, and to be able to feed information in or draw information from the use of such an approach.

Some of the engineers who have heard of PHAST and are interested to learn more about it felt excluded when workshops, about this methodology, took place in their province. It was felt that an exclusive group was chosen to attend these workshops and no further opportunities to learn about it have arisen since. NGO engineers are most familiar with these approaches as the social and health personnel in their organisations frequently use them.

The engineers who have been using PHAST made a point that the tools used in this methodology are flexible but have to be focused. The tools must not be used for the sake of it, but they should contribute towards the project. Decisions should be recorded, so that engineers can use the information gained by these tools.

G) Engineers and communication

Engineer and community

Communication between the community and engineers takes place via committee meetings and mass meetings. Decisions taken in a committee meeting are supposed to be fed back to the community by the committee. According to the engineers this ought to happen via mass meetings but the transfer of decisions does not always happen. There is no awareness of other communication routes in the community. Most often there is no direct line of communication between individual households and the committee or engineer. Designs get explained to the community after agreement has been reached with the committee about the designs. As one engineer puts it: ‘Once we have oriented and

schooled the committee, the proposal goes to the entire community.’ The following methods of presenting designs are commonly used:

- black board or flip chart;
- technical design drawings;
- walking the route of the pipes.

Some of the engineers indicated that engineers are not the best communicators and that they would like to learn about other ways of communication including proper facilitation.

Engineer and social consultant

Communication routes between engineers and social consultants hardly exist. Communication is only out of pure necessity at monthly meetings and vital information often does not get transferred. There seems to be a lack of common vision between both parties towards the project. This will be discussed later in this chapter.

H) Engineers and training

Training for operation and maintenance is generally carried out by the engineer on the job. The requirements for training are described in the guidelines of the funder, but some of the engineers said that often only lip service is given to this. Funders are carrying out limited monitoring of training. Financial training and other training are generally carried out by a social or training consultant. Although operation and maintenance training is seen as important, it does not seem to be treated as important.

I) Engineers and social consultants

Engineers see social intermediation as a very important part of the project in order to enhance sustainability. All engineers interviewed stated that they should work as a team with the social consultant and that there should be a common vision towards the project. However, few of the engineers (less than ten per cent) have had good experience working together with a social consultant. Introducing the subject of social consultants in the interviews brought up such reactions as: ‘Huge problem creators’ or ‘Parasites that is what they are.’

The role of the social consultant (see para. 3.5) is not clear to most of the engineers. Some engineers see the social consultant purely for the training of the community and building the institutions around the water services agreement. Others see them as forming a wider liaison with communities but feel that they are not equipped to take this role. Most of the engineers indicated that the technical knowledge of the social consultants is almost non-existent and because of this it is impossible to leave anything technical to the social consultant for discussion or liaison with the community.

Another problem for the engineers is that the social consultants are not seen as professionals because most of the social consultants do not hold a formal degree. Engineers and social consultants come from very different professional and often cultural/racial background. These different backgrounds hinder communication between the social consultant and the engineer. An engineer in the Eastern Cape put it as follows: ‘we are not able to correct each other because the Xhosa (tribe) person

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would not challenge people and the Whites are not sensitive about that.’ Some of the engineers (white) believe that the problems lie solely in the difference in culture and race.

There are consultancy firms, which have separate departments for social consultants within them. This works much more to the satisfaction of the engineers. All engineers working in this way confirm that this works well and that roles and responsibilities are clear and that there is communication about the project. The problem comes when the engineers are forced to work with a social consultant they have not chosen themselves. This is happening on many projects. One of the interviewed engineers, who has a social department within the organisation describes: ‘the external social consultant I was forced to work with, had never worked in the field and every single minute we talked about the project got charged, the money run out very soon and we ended up doing the social work ourselves anyway.’

There is current debate in the Mvula Trust and DWAF as to whether social consultants should have the leading role in projects to ensure that social issues are the main focus of the project. About fifteen per cent of the engineers would accept the social consultant in a leading role if he/she had the capacity. Most of the engineers felt that they have to be in charge of the project or at least at the same level as the social consultant. The main reasons against social consultants taking a leading role is their lack of project management, financial and organisational skills. Although engineers would like to keep the leading role and admit that they are the ones who should be ‘in control’, the following problem was highlighted several times: ‘on DWAF projects, the social consultant works under the engineering firm. We do not have the skills to assess their work, so we just pay them and no-one monitors what is actually happening.’

The main problems identified between the engineer and the social consultant concern attitudes, knowledge and professionalism. Engineers’ attitudes towards the social consultant seem to change when he or she is within the same organisation. Engineers are likely to be able to manage social consultants when they are ‘in-house’ and the engineer can still be in control. This apparent lack of professionalism and knowledge means that the engineer has a very negative view of the social consultant.

J) Engineers and non-technical issues

Engineers agree that being an engineer in rural water supply is very different from conventional engineering projects. They acknowledge that social and institutional issues are very important for sustainability of these projects. Although they are acknowledged to be important, these issues are not being fed into technical designs by 80% of the engineers. Most engineers also admit that they find it difficult to accept that non-technical people can make decisions about technical matters.

Two engineers mentioned that cultural beliefs are very important determinants for a technical design. If something is not acceptable because of cultural beliefs, it will not work. Both engineers agreed that it was very difficult to understand and sometimes throw the ‘best’ option ‘out of the window’.

K) Engineers and gender

Women are involved in the projects because of the project policy, and are sometimes there as tokens. Although the importance of women is recognised by almost all engineers, this does not mean that engineers consciously involve them in the project more than policy prescribes.

Different responses to gender were noted between engineers from the Northern Province and the Kwa Zulu Natal. In the Northern Province engineers said that women were actively involved and were accepted even in roles like project manager, while in the Kwa Zulu Natal the role of the women was not really acknowledged by the communities.

L) Engineers and the poor

Engineers do not consider including the poor in the project as their responsibility. It is felt that the poor are addressed in provision of the lowest level of service i.e.: standpipes. There is a general consensus that the community looks after the poorest. Every community has its own way of addressing the poor.

M) Engineers and the client

There is disagreement between the engineers over who the client is. In cases where the funder is seen as the client it is quite clear which directions are followed in implementation of the project. For example, the designs are suited to the guidelines of the funder and not considered at community level. In the cases where the community is seen as the client, it is not completely clear what this means. Often it is felt that there is a lack of skills and abilities in the community to take on the full client role. And although the community is the client the principle of management at the lowest appropriate level does not seem to be really understood in all cases. Often engineers try to make up for the lack of skills and abilities by advising and steering the community in a certain direction. A South African engineer who has written a paper about this matter recently adds that also practice has proven that even when engineers are contractually tied to communities, they still tend to disregard the communities and address the funders as clients (Kotze, 2000).

5.1.2 Engineers' views on current approaches

Over 70 per cent of the engineers who know the Mvula Trust approach (see para. 3.3.4) to delivery of water supply services, believe that this approach creates more sustainable projects than the approach DWAF (see para.3.3.1) has taken. It was agreed that the community is much more involved and in charge of the project and that the engineer gets to know and understand the community better because of a great deal of interaction. DWAF projects are generally considered easier to implement, as the approach is more straightforward.

The downfalls in the Mvula Trusts approach are that the projects often take a long time, lose momentum and the community loses interest. Lack of monitoring the implementation of projects and not knowing what is happening on the projects by has been voiced several times for both Mvula Trust and DWAF projects. Engineers noted that the supporting role of the Mvula Trust towards the engineers implementing their projects was very limited. There was a general consensus on the limited budget for supervision in the Mvula Trust projects. It was felt that to implement a project properly according to the Mvula approach meant that no money could be made by the

engineering firm. There was only one engineer who had a different opinion regarding the limited budget. His argument was: ‘if you are committed to the project and focus on that project you are able to finish it within the budget. As soon as the engineer gets distracted the project starts to drag on’. About 50 per cent of the engineers felt that the shortage in the budget (for both Mvula Trust and DWAF) was not only restricted to the implementation of the project but, also to the monitoring phase. The engineers claim to be involved after the project is handed over to the community (and/or local government), to ensure the project keeps going. This time invested in the monitoring of the project cannot be claimed. Some engineers felt that in the DWAF approach not enough emphasis was given to training apart from production of guidelines. That confirms the conclusion that only lip service is paid to training, as mentioned earlier in this chapter.

Limited information is available on the local government and the BoTT approach, as not many engineers interviewed are involved in local government and BoTT projects. BoTT projects in general are seen as large and expensive projects. Engineers believe that the institutional development within BoTT projects is much stronger because of greater emphasis on this aspect than in Mvula Trust or regular DWAF projects.

5.1.3 Engineers’ views on DRA

Not many engineers had heard of the term ‘demand responsive approach’. The only engineers familiar with DRA are DWAF engineers at managerial level, NGO engineers and 2 private sector engineers. Some of the participants felt that it was not too different in comparison with how they currently implement projects. Others felt that it would be quite a shift in implementing water supply projects. About 40 per cent of the engineers working on Mvula Trust projects perceive the Mvula approach as close to DRA.

5.1.3.1 Perceived benefits

85 per cent of the engineers indicated that DRA ultimately contributes towards sustainability of rural water supply projects because of:

- **Addressing real needs;** Community priorities would be addressed and they could get what they want. As one engineer said: ‘a product would be sold to the requirements of the consumer.’
- **Ownership;** The majority of the engineers felt that DRA would increase ownership of ideas and decisions. It was felt that attitudes in the community towards the project would be changed through increased awareness and informed decision taking. They would be the ones who are influencing the process and would therefore feel ownership. Some of the engineers thought an advantage of the increased ownership of ideas and issues was that the decisions are much more likely to be backed up at a later stage. It was also thought that people might be more willing to put resources into and manage the project.
- **Technology;** About 35 per cent of the engineers commented that DRA would allow more appropriate technology and that better projects would be the result of appropriate designing.

5.1.3.2 Perceived constraints

Perceived constraints of DRA by engineers are:

- **Budget and time;** Engineers unanimously saw budget and time as the major constraints. The constraint of time is three fold:
 1. Supervision of the project will be time-consuming and this translates into a large budget.
 2. The planning phase and development of skills, raising awareness and education in the community will also take considerable amounts of time and the community might not be interested in 6 months preparatory work. They want to see construction on the ground.
 3. The time for water service delivery to the country will take longer as individual projects take longer. Above all politicians and people on the ground want to see the backlog of water services addressed in the shortest possible period of time.
- **Politics;** The majority of the engineers doubted whether DRA would be politically acceptable, as the emphasis is not on the infrastructural side of the delivery of water, and politicians like to be seen to deliver big infrastructural schemes. Real demand will never be created if the government keeps on paying for schemes or if local politicians promise that government will pay, not only for the capital but also for the recurrent cost of the schemes.
- **Willingness to pay and meaningful contributions;** 50 per cent of the engineers believe that it is difficult to get reliable results from up-front studies because of bias.
- **Size of projects;** Many engineers felt that the size of the project mattered in order to be able to adopt DRA. If the village has more than 3000 people, it was felt that it is not possible to deeply involve the community and give options.

The following constraints are difficult to put into percentages but most have been mentioned several times.

- **Community expectations;** Many communities think that it is the responsibility of the government to deliver water to a certain level of service.
- **Affordability level;** The level of affordability is what people will be judged on, and this means an unfair distribution of resources i.e. the poorest will only get standpipes and the rich a reticulated system.
- **Problems at funders level;** DRA is unlikely to work due to lack of capacity to implement this approach at funders level because of weak monitoring, different agendas, etc.

5.1.3.3 Perceived implications for the engineer

Perceived implications of DRA by engineers are:

About 70 per cent of the engineers saw implications for their role in the projects. These implications voiced by the engineers included:

- engineers need to find out what the client really wants and therefore the engineer should be much more open to work in a multi-disciplinary team;
- engineers are not needed throughout the whole project cycle;

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- engineers are not required to make so many decisions;
- the terms of reference used by the engineer for the design can only be determined after the baseline survey. The engineer starts the design at a different stage in the project;
- The engineer's role is solely to provide advice on technically sustainable technologies and to be the implementer of contractual issues.

It was mentioned several times that not only the role of the engineers changes, but that the approach also has institutional implications for the engineer's parent organisation. Engineers did find it difficult to describe these implications but it was mentioned that they needed the back up of the organisation and that some of the procedures within the organisation regarding rural water supply would have to change.

Twenty per cent of the engineers emphasised that this approach needs implementation by people who believe in it and who have a clear picture of their role. Externally all the role-players should take the same approach, but the community also needs to be on-board. Because of the past and current approaches, the community could initially sit back and wait for the engineer to make things happen. It is also felt that communication structures should be set up not only between the external role-players but also within the community.

A majority of the engineers do not think that attitudes towards the projects need to change significantly in comparison with existing attitudes. Two comments were made regarding attitudes needed for DRA:

- there should be a change of attitude as the engineer should be able to take advice from people not as qualified as him/her and then to translate this information into appropriate designs;
- More patience is required to enable communities to become engaged in the process of decision making.

5.1.3.4 Possible assistance to engineers

Engineers do not perceive benefits for themselves or other external role-players and perceive only external constraints to the adoption of DRA. No mention is made about constraints within their own capacity. The engineers did not indicate themselves that they could be assisted in adopting DRA, but when the author introduced this subject 80% of the engineers revealed that they could be assisted in their role of engineers on rural water supply projects. The following assistance could be given to engineers (as identified by engineers):

Training in

- community dynamics and perceptions (two engineers mentioned that the study of community anthropology could be helpful);
- PHAST or other participatory approaches;
- facilitation techniques;
- communication techniques.

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Table 5.2. Rating of engineers' attitudes towards DRA

<i>Description</i>	<i>Percentage</i>
Engineer A believes that there should be community involvement and shared decision-making but also believes that decisions should be based on technical expertise, and therefore the giving of options and decision-making in the project is quite limited.	33 %
Engineer B believes that there should be community involvement and shared decision making. He/she would like adoption of DRA in order to increase the chance of sustainability. The fear of this engineer is that because of external constraints this adoption is not possible, and therefore he/she does not feel to be able to contribute towards DRA.	17%
Engineer C believes that there should be community involvement and informed decision making. He/she would like (partial) adoption of DRA in order to increase the chance of sustainability. The fear of this engineer is that because of external constraints this adoption is not fully possible, but still feels that he/she can play a role in taking up this approach and is therefore willing to learn about his/her role in the approach.	35%
Engineer D has taken up demand and informed decision making in the project. The engineer has some knowledge of DRA and is willing to learn further. External factors are affecting, but not determining, the approach taken.	15%

Seminars/workshops

- to share experiences and to learn from others;
- to hear about and share different technologies;
- to hear about different approaches.

Literature

- case studies of good and bad practices;
- user friendly booklet, showing different technical options that could help the engineer explain options to the community.

In general, the engineers said that they do not have time to keep themselves up-to-date of what is happening in the water sector. Most engineers, who are trying to keep themselves informed, do so mainly via professional magazines and the World Wide Web. Engineers using the World Wide Web felt that it was difficult where exactly to find up-to-date information. It was identified that they could be assisted through regular up-dates of new publications by organisations, such as DWAF or the Mvula Trust.

5.1.4 Rating of engineer's attitudes towards DRA

The engineers are rated into four categories with regard to their knowledge, understanding, beliefs and attitudes towards DRA. Table 5.2 gives an overview of where the engineers are in the process of adapting to DRA.

Analysis of table 5.2

- engineer A has no/limited belief in and/or understanding of DRA. He/she pays lip service to community involvement but what he/she does in practice contradicts his/her words. The engineer does not believe that it is his/her responsibility to take on DRA. The engineer does not see a reason to change;

- engineer B recognises the advantages of DRA, but has personal resistance to change which is strengthened by external constraints;
- engineer C believes in the principles, or some of the principles, of DRA. External constraints do not produce resistance to change. The engineer is willing to change (parts of) his/her approach;
- engineer D has a good understanding of DRA, and has adopted part of it and is eager to learn more about it. This engineer has changed his/her approach from conservative engineering to a DRA type of approach.

Engineers A and B are likely to see the funder as a client, as they are concerned with the external factors instead of the community and the projects seems to be technology driven. (Engineers A and B totals of 50 per cent). This confirms with the findings in 'typical responses' table where 50 per cent of the engineers regard the funder as the client. Engineers C and D are likely to see the community more as the client. In this category are the NGO or developmental types of engineers.

5.1.5 The view of non-engineers on the engineers and approaches

5.1.5.1 The views on the engineer by non-engineers

Mvula Trust project development facilitators (PDFs) from different provinces indicated that in general engineers have problems adopting a role where they listen to the community and put the community first in the decisions taken. As one of the PDFs put it: 'the engineer thinks for the committee, taking the process of decision making away.' It was also agreed among the PDFs that engineers often focus on one person (the strongest) in the committee to communicate decisions and that poor and other vulnerable groups are not taken into account, as this is not considered necessary or seen as the responsibility of an engineer. One of the main problems indicated by some of the PDFs is how to advise the engineer on guidelines, policies, and presentations to the community and the project in general. The PDFs felt that they face an attitude of 'do not try to tell me too much about my job'. Although the PDFs are critical towards the engineers, it was also believed that not enough support was given to the engineers to help them understand and adopt a more developmental role. It was also mentioned that, because of financial and technical constraints, there is no opportunity to develop systems with the communities.

A social consultant felt that engineers still see institutional and social development (ISD) as unimportant in the project. It was felt that the projects are still about infrastructure and the engineer does not want anything to do with the operation and maintenance of the project. Another social consultant indicated that the emphasis of the engineer might not be on the ISD, but that he has never worked with an engineer who did not realise that the community has an important role to play.

It was felt that over 80 per cent of the engineers would not be able to adapt to DRA as the engineers lack certain skills and attitudes in the current approaches. All interviewees unanimously agreed that the engineers could be assisted in their role of implementing rural water supplies through reading, debates, training courses and workshops.

Although non-engineers agreed that engineers could improve many skills and attitudes, it was also acknowledged that working with social consultants, to get the right balance of social and technical has proved to be difficult. PDFs, social consultants and other role-players unanimously agreed on the general weakness of social consultants in the sector. They indicated that only a few social consultants have the capacity to do the job, the remainder lack technical understanding and professionalism. From the small sample of social consultants interviewed it has become clear that important characteristics of DRA are not known or fully understood. One of the social consultants interviewed said he had never heard of participatory approaches and never considered involving more members of the community than the committee.

5.1.5.2 The views on approaches by non-engineers

DWAF

The DWAF key informants believe that DWAF has gained an enormous amount of expertise, because of huge expensive mistakes. It is acknowledged that the projects are still 'top down' but that more is being done to involve the community in the projects. In the Eastern Cape it was felt that the most important shortcomings in the department concern the appointment of engineers and social consultants, and that the technical nature of the projects is too complicated.

Some individuals in DWAF have a very good understanding of DRA and would like to see the approach being adopted within the water service delivery, but it is felt that DRA is not seriously considered as it could interfere with the political agenda. At national level DWAF has taken the initiative to develop guidelines concerning different technical options. However, these guidelines do not include low technology options. Initiatives are taken to keep improving the ISD package (para. 3.2.1). This package is not enforced and it is not clear how well it is used in the provinces.

Mvula Trust

Although a 'new' model has been developed (see para. 3.3.4), it is not felt that Mvula Trust has adopted the new approach on the existing projects. Some interviewees indicated that the Ausaid programme has made the right move towards DRA, with a multi-disciplinary approach to project implementation involving all role-players. Interviewees indicated that although within the organisation people are willing to change, not much effort has been made externally by the regional staff externally to advocate DRA. In order for DRA to be advocated and to be fully adopted the District Council meetings will have to be attended but, as one PDF put it, 'Mvula is too concerned with income and those meetings are too costly as they cannot be charged. Therefore no progress has been made.'

PDFs felt that Mvula Trust does not spent enough time on monitoring and evaluation of the projects. Lack of monitoring on Mvula Trust and DWAF projects is also recognised by other non-engineers implementing the water projects. It is felt that representatives of these organisations should be more 'hands on' and attend meetings in order to facilitate proper implementation. Enough time and budget should be allocated to these items.

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Most interviewed felt that Mvula Trust projects have much more community involvement and decision taking and that DWAF has got the right approach on paper but no real community involvement in project implementation. In general implementation of Mvula Trust projects was preferred as it is felt that they have a higher chance of sustainability. One social consultant did not think that the Mvula Trust approach is empowering the community at all. It was felt that this approach interferes too much with the community and does not leave problems and decisions to the community. Also 'Mvula Trust bends over backward in order to address the poor and that is not empowering. If you tell the community they cannot afford it that they will believe that they cannot afford it, and they never come any further.'

5.1.6 Other important factors affecting the adoption of DRA

This paragraph describes important factors influencing the role of engineers and DRA, which are not described in any of the previous paragraphs. These factors are identified by engineers and non-engineers and are difficult to quantify as some are individually mentioned.

Political

Some of the interviewees felt that the DRA process requires a significant increase in time for the project implementation. Time translates into more funding being needed for a project. If DRA needs more time and money, this means that the delivery of projects will slow down. If delivery slows down, it will take longer for all South Africans to be supplied with water and this is not politically acceptable.

Policy and guidelines

Flexibility of guidelines

Funders want engineers and other role players to follow their policy and guidelines. Several interviewees indicated that it could be very difficult for an engineer to follow the policy and guidelines and to use DRA, when the policy and guidelines are not flexible and adaptable.

Lifeline supply

Interviewees from one of the NGOs focused on a present campaign led by the Rural Development Service Network (RSDN) that wants the government 'to ensure the implementation of a national cross-subsidisation for 50 litres of free, clean water per person, per day'. One of these NGO key informants argued that DRA might not be appropriate as it implies that consumers could only get the level of service they can afford and that this is not fair as 'water is a social good' and everyone has the right to access to water (as described in the South African constitution). It is felt that the poor are excluded by this approach. The share of water in South Africa is very uneven and there is such a rich world within South Africa that could subsidise the poor within the country. It is felt that the poor are at present consciously denied access, and that the payment for services and what is now happening in the water service delivery sector are contradictive to the South African constitution. It was felt that social and institutional factors would still be very relevant to the success of the project, even with a free basic supply.

Local government

It was frequently mentioned that local government should be on board in the DRA process for it to work. It was mentioned that if the implementing role-players, such as engineers, are using a DRA type of approach and this leads to decisions about options, operation, maintenance, management and inclusion of the poor, the local government has to back up the approach otherwise these efforts are wasted. For example, alternatives chosen by the community for the poorest to contribute to the project could be the cleaning up of tapstands, instead of a financial contribution. If the water services authority does not regard this as a formal method of payment, than this solution to address the poor in the community will not work.

Many role-players voiced their concerns about the sector's, in particular DWAF's, lessons learnt over the years becoming lost when responsibilities are transferred to local government. Non-DWAF people and DWAF people agree that many lessons have been learnt over the last years and that efforts are being made to improve their service delivery. Interviewees from local government did not seem to agree with the opinion that lessons learnt will be lost, as they have adopted the DWAF documents for project appraisal, business plans, water service development plans and the monitoring and evaluation systems.

Contracts

Contracts were mentioned by some of the key role players and PDFs as an important factor in determining the engineer's role. The following issues regarding contracts have been identified:

- there are no incentives for the engineers to design at an appropriate level. In many cases, on the DWAF projects, the fees of the engineer are based on a percentage of the designed infrastructure. The more expensive the infrastructure, the higher the fees;
- another problem is that the contract is only for the duration of the work, and the engineer cannot be held responsible when the project is not sustainable after implementation of the infrastructure. This means again that there is no incentive to emphasise sustainability issues;
- DWAF contracts and matching guidelines for engineers are clear on responsibilities regarding designing of infrastructure, but not clear on the level of community involvement. They state that the community should be involved, but do not define exactly what responsibilities engineers have regarding community involvement. Also the roles and responsibilities between social consultants and engineers are not clearly defined, which results in certain tasks not being taken up by neither party.

Education

Both engineers and non-engineers agree that implementing rural water supply projects is very different from conventional engineering taught in the universities. Many believe that true understanding of implementing rural water supply will only come when engineering is also taught in a social and developmental context.

Responsibility of implementation of DRA

Some private organisations (engineering and social consultants) said that implementation of DRA should be the responsibility of an NGO. They argued that the private sector

would be limited in the implementation of the DRA process, because of funding. It will be too expensive for them to implement DRA, as they have large overhead costs. It was felt that NGOs have core funding to carry the cost of implementing DRA.

5.2 The comparative analysis

The comparative analysis compares:

1. The ideal characteristics of the engineer (see para. 2.4.3) against the findings of characteristics of engineers in current approaches
2. The ideal external factors affecting engineers in DRA (see para. 2.4.3) against the existing external factors affecting engineers in DRA.

These findings are a generalisation of the engineers, based on the typical responses, the descriptive analysis and further analysis of the interviews. This comparative analysis is shown in table 5.3 and table 5.4 and provides an overview of the findings of the existing characteristics and external factors. This overview is drawn up to provide a clear indication of the gaps between the ideal and existing situation. The gap is identified in paragraph 5.2.1.

5.2.1 Identification of the gap between the ideal and existing situation

This paragraph attempts to summarise the gap in terms of technical, social, institutional, financial, political and control. The technical, social, institutional and financial are factors identified by WELL (1998), as contributing to sustainability of projects and if these gaps are bridged the chances of sustainability will increase. The author has added two more factors to identify the gaps; political and control. The identified gaps are:

Technical

- inadequate knowledge of appropriate technologies;
- lack of knowledge of willingness- to-pay and informing demand;
- no experience in designing for a mixed level of service based on willingness to pay or based on willingness to make other meaningful contributions;
- designs do not have enough flexibility and adaptability;
- inadequate skills of communicating technical issues.

Social

- inadequate knowledge of all factors contributing to technology;
- inadequate knowledge and understanding of community dynamics;
- community not enabled to make informed decisions;
- lack of poverty focus and inadequate gender focus;
- inadequate involvement of the community as a whole.

Table 5.3. Comparison between the ideal and existing characteristics of engineers

<i>Ideal characteristics of an engineer in DRA.</i>	<i>Findings of existing characteristics of engineers in present approaches.</i>
<p>Knowledge</p> <ul style="list-style-type: none"> ■ Sustainability factors in the project ■ Appropriate technology ■ Quality assurance ■ Local materials ■ Community dynamics, economics and other issues ■ Policies and guidelines ■ Participatory approaches (basic understanding) 	<ul style="list-style-type: none"> ■ Reasonable knowledge of sustainability factors, often only cost-recovery and institutional development are seen as sustainability factors ■ Limited knowledge of appropriate technologies (see para. 5.1.1.1a) ■ Full knowledge of quality assurance ■ Good knowledge of local materials not often used ■ Engineers think they know community, practice proves different (see para. 5.1.1.1b) ■ Basic knowledge of policy and guidelines ■ Limited knowledge and understanding of participatory approaches (see para. 5.1.1.1f)
<p>Skills</p> <p>Technical options</p> <ul style="list-style-type: none"> ■ Ability to translate willingness-to-pay and consumer demand into feasible technical options, including different levels of service, associated costs, operation and maintenance and management ■ Engineer must have technical flexibility and adaptability 	<ul style="list-style-type: none"> ■ Consumer demand not taken into account as it does not get measured at the present moment ■ Very limited options are provided. (See para. 5.1.1.c) ■ Limited technical flexibility
<p>Communication</p> <ul style="list-style-type: none"> ■ Ability to feed back to and draw on information from social consultant. ■ Ability to present options and facilitates discussion at the right level ■ Ability to communicate with households or other groups than a village water committee ■ Ability to train the people that run projects, not only to operate but also to set goals and indicators ■ Ability to be a team-player ■ Ability to step back and let people think for themselves ■ Ability to listen, be open, approachable and flexible 	<ul style="list-style-type: none"> ■ Very limited communication with the social consultant (see para. 5.1.1.1g) ■ Fair ability to present options, limited ability to facilitate discussion (see para. 5.1.1.1g) ■ No structures of communication other than with committee (see para. 5.1.1.1g) ■ Training by engineers is limited to on-the job practical training (see para. 5.1.1.1h) ■ Acknowledged, but difficult when partner in the team is less professional ■ Engineer likes "to think for the committee". (see para. 5.1.4) ■ Engineer is willing to listen as long as their advice based on current knowledge and experience is taken
<p>Attitudes</p> <ul style="list-style-type: none"> ■ Willing to accept community decision taking ■ Willing to communicate and put trust in a multi-disciplinary team especially the social consultant ■ Willing to accept non-technical issues to determine technical issues ■ Willing to accept gender as part of the project ■ Willing to accept a poverty focus in the projects 	<ul style="list-style-type: none"> ■ As long as advice of engineer is followed (see para. 5.1.1.1E) ■ No trust in the social consultant (see para. 5.1.1.1) ■ In practice very difficult to accept non-technical issues to determine technical issues. (see para. 5.1.1.1k) ■ Acknowledging of gender is an important part of the project (see para. 5.1.1.1k) ■ Not seen as the responsibility of engineer (see para. 5.1.1.1l)

Table 5.3. Comparison between the ideal and existing characteristics of engineers (cont.)

<ul style="list-style-type: none"> ■ Willing to see and respect the community as the client ■ Willing to design for the community as client and take their needs into account instead of designing the best infrastructure ■ Willing to see development as a process not as a business ■ Willing to put emphasis on sustainability issues, instead of infrastructure ■ Willing to adopt participatory approaches ■ Willing to be patient as the process could take longer ■ Commitment & dedication to community development <p>Motivation</p>	<ul style="list-style-type: none"> ■ Reasonably willing to regard the community as the client (see para. 5.1.1.1m) ■ Very limited designing for the community as client (see para. 5.1.1.1M) ■ Dependent on the type of engineer. NGO types of engineer more willing to see development as a process than private sector oriented type of engineer. ■ Some sustainability issues are taken into account in the projects but emphasis often on infrastructure ■ Possible when knowledge about participatory approaches is built up (para. 5.1.1.1h) ■ As soon as project take longer it is felt that the projects start dragging on. ■ Engineering is not linked to community development, depends on the individual engineer
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Table 5.4. Comparison between the ideal and existing external factors influencing engineers

Existing external factors affecting engineers in DRA	
Ideal external factors affecting engineers in DRA.	Existing external factors affecting engineers in DRA
<p>Policy, standards and regulations</p> <ul style="list-style-type: none"> ■ Policy around water service delivery should create an enabling environment for implementation of DRA 	<ul style="list-style-type: none"> ■ Policy contradictory; it enables DRA in key principles and it limits DRA in prescription of RDP standards and other policies ■ Restrictive guidelines for implementation of DRA
<p>Funding</p> <ul style="list-style-type: none"> ■ Funding should provide for the whole DRA process 	<ul style="list-style-type: none"> ■ Funding goes into institutional and social development and basically this results in funding going into training. No funding provided for the time in the process of assessing demand, informing demand and responding to demand ■ Limited funding available for travelling time
<p>Targets and Deadlines</p> <ul style="list-style-type: none"> ■ Cash flow should allow DRA instead of being focused on meeting targets 	<ul style="list-style-type: none"> ■ In many water projects strict targets and deadlines are set, which does not allow the process of extensive community participation. In DWAF projects the time pressure is really felt as otherwise no further funding can be obtained
<p>Political issues</p> <ul style="list-style-type: none"> ■ Political will should allow DRA in order to enhance sustainability above infrastructure service delivery ■ Communities' expectations of service delivery 	<ul style="list-style-type: none"> ■ Politicians are more interested in delivery of infrastructure (see para.5.1.3.2) ■ Community has high expectations of the government to provide the services and pay for these services
<p>Social Consultants</p> <ul style="list-style-type: none"> ■ Professional knowledge, skills and attitudes ■ Must be willing to work together as part of a multi disciplinary team (in particular with the engineer) 	<ul style="list-style-type: none"> ■ Very limited knowledge and skills
<p>Multi-disciplinary teams</p> <ul style="list-style-type: none"> ■ DRA should be integrated into the whole team 	<ul style="list-style-type: none"> ■ No conscious agreed approach towards most projects at present by most funders. Initiatives are taken to change this with the Mvula Trust AusAid programme (see para. 3.3.4)
<p>Contracts</p> <ul style="list-style-type: none"> ■ Contracts should be clear on budget, and on roles and responsibilities of different role-players 	<ul style="list-style-type: none"> ■ Contracts not clear on level of community involvement (see para. 5.1.5) ■ Contracts not clear on roles and responsibilities of role-players
<p>Organisational back up</p> <ul style="list-style-type: none"> ■ It will be very difficult for a single person to adopt DRA if there is no organisational back up 	<ul style="list-style-type: none"> ■ Increasing numbers of engineering firms have an 'in house' ISD department or are linking up with a social consultancy firm ■ Project engineers have limited time to be out in the field, and often focus on administrative tasks ■ Limited support for a single engineer trying to take different approach from the conventional engineering approach to water supply projects

Institutional

- lack of exploration of operation and maintenance options;
- inadequate training in operation and maintenance;
- inadequate partnerships and teamwork between different role-players;
- lack of communication between engineer and social consultant;
- lack of clear roles and responsibilities;
- inadequate treatment of community as the client, and addressing their needs;
- inadequate contracts to enforce DRA;
- lack of support from institutions.

Financial

- inadequate funding for DRA process;
- inadequate distribution of funding.

Political

- lack of enabling environment to adopt DRA because of policies, guidelines, targets and deadlines;
- lack of enabling environment to adopt DRA because of political promises and expectations.

Control

- engineers do not want relinquish control;
- interference in participation and decision-making by engineers;
- inadequate openness, approachability and flexibility;
- lack of trust in social consultant;
- lack of acceptance of non-technical issues determining technical issues.

5.3 Discussion of analysis

This paragraph discusses the findings of the research as opposed to the findings of the interviews.

The existing knowledge, skills and attitudes of the majority of engineers are not towards DRA. It has become clear that most engineers implement rural water supply in a framework of dominant conservative engineering thinking, values, attitudes, methods and behaviour. Chambers (1993) refers to this framework as 'normal professionalism'. Although engineers acknowledge sustainability issues, they stick to their designs and construction methods and hold back in looking at issues such as operation, maintenance and management. Examples of this can be found in the fact that consumer demand does not get taken into account and that there is little emphasis on training. Besides the political framework, the limit in giving of options is related to the ease of use of familiar methods, to the attitude that non-technical people cannot make technical decisions and that communities do not

know anything about the consequences. The latter two are confirmed by Brokensha et al., (1979) who states that the major rejection by development professions is of the validity of the knowledge of rural people or indigenous technical knowledge. Chambers (1993) describes behaviour such as the use of a familiar method and sticking to known design and construction methods as a defence mechanism within normal professionalism. This defence could cause 'resistance to change'. From the rating of engineers (see Table 5.2) it can be found that over 50 per cent of the engineers have a resistance to change that it is most likely to be grounded on normal professionalism. The defence mechanism within normal professionalism is not confined to engineers or engineers in South Africa but could be found in every profession.

Engineers seem to have difficulty with relinquishing control; they want to drive the project. This can be found in their relationship with the communities and with the social consultant. It seems that engineers want to stay in power. Part of the difficulty of relinquishing control could also be lack of communication. The research has identified gaps in communication. Engineers are not known for their communication skills and as Scott (1984) put it 'they can be heard confused, difficult to understand and rambling'. Communicating with people from the community (in particular with the poor or about issues like gender) or other professions (in particular the social consultant) poses problems in many cases. These problems are not openly disclosed but acknowledged when discussing the subject (See para. 5.1.3.4). Communication skills are not part of the formal engineering education systems and engineering degrees focus on things rather than on people. Due to this lack of communication skill the engineer is likely to lack either insight, understanding or respect of the community. Power, 'focus on things', control, standards, and certainty are issues identified as very important by the engineer. Chambers (1993) sees these issues as part of deep preferences of the normal professional, which influence individual perception, choice and behaviour. This could explain the focus on infrastructure, instead of on the uncertainty of operation, maintenance and management of the projects.

Although many engineers have identified that they would like to learn about participatory approaches, it could be questioned whether they would be willing to use them on their projects. Mukherjee (1995, 27) states that participatory approaches provide space for local people to establish their own analytical framework and thus challenge 'development from above'. From this research it has become clear that participation and shared decision-making is a difficult process to accept as engineers have major difficulties with relinquishing control and leaving the community in charge. Therefore it is unlikely that the majority of engineers would conform to the use of participatory approaches.

Among the engineers there is a discussion of what is 'responding to demand'. For some it means adopting appropriate technologies that people can afford and sustain with their contributions. (this is not necessarily the low cost option). For others 'responding to demand' only means adopting higher levels of service, as this is believed to be the only way to ensure cost recovery. This debate reflects a wider debate at national and international level, not only by engineers. Dryer (1998) states that in many instances the level of service provided by the water scheme did not meet the expectations of the villagers and therefore they would not pay. Altaf et al (1992) and Joyce (1995) also argue that even poor people are willing to pay a significant amount of money for an individual supply.

ANALYSIS OF INTERVIEWS

This contradicts a speech held by the South African Minister of Department of Water Affairs, Ronnie Kasrils (2000), who had just visited a newly installed water supply scheme in a typical South African village and found out that people were using alternative sources, as they could not afford the water from the communal taps.

It has become apparent that there are many problems between the engineer and the social consultant. Although some of the white engineers believe that very different racial and cultural backgrounds cause the problem (see 5.1.1.2I), it was recognised that both white and black social consultants are facing the same problems with engineers. Therefore these problems are not racially or culturally related. The main problems identified are poor understanding of the social consultant, lack of trust in the social consultant, lack of knowledge and professionalism (of the social consultants), lack of communication between the engineer and social consultant and the fact that the engineer wants to be in control.

Engineers, social consultants and PDF's agreed that there is a lack of monitoring on the projects by the funding organisations.

The rating of the engineer (see para. 5.1.4) and the gap identified between the existing and ideal situation general (see 5.2.1) shows that the majority of engineers do not (yet) have the knowledge to implement DRA.

On paper there is a strong commitment by government to most aspects of DRA (see para. 3.2) and individual efforts are taken to adopt or improve these aspects, but pressure to deliver services and lack of monitoring of projects result in most of the projects taking the supply driven approach. The existence of operation and maintenance subsidies for most DWAF projects, is creating an environment of dependence and expectations in the communities that influences how DRA will be received. Incentives for engineers to adopt DRA are limited because of no enforcement to use this approach in the contract and lack of monitoring on the projects. The identified downfalls in the current contracts are recognised by some role-players in the South African water sector. Kotze (2000) recently produced a paper where outcome-based engineering contracts for rural water supply projects are proposed.

The campaigning by the NGOs towards a free 'lifeline' supply (see para. 5.1.5) could give a different focus to the implementing of water service delivery and would not allow for DRA, if DRA is defined as by the World Bank where demand is backed up by willingness to pay for a chosen service. If the government policy is to subsidise fully a basic level of service than demand still needs to be 'captured' in order to encourage a sense of ownership and associated managerial responsibility. This 'capturing' of demand means that people can choose the level of service they need, with associated rights and responsibilities. Not everyone may want a basic, although free, level of service. Thos that do should still be able to determine many of its unfixed characteristics in return for meaningful contributions such as time, labour or materials (Deverill, 2000b).

The free 'lifeline' campaign has been quite successful, as the Minister is now considering a scheme to offer South Africans a basic amount of water free of charge (WWE, 2000).

Chapter 6

Conclusion and recommendations

6.1 Conclusion

Sustainability of rural water projects is a major challenge and an important goal for the rural water service delivery sector in South Africa. There is consensus among practitioners that the demand responsive approach (DRA) plays a critical role in the promotion of sustainability, as this approach is a response to a clearly expressed demand, that is backed up by a willingness to pay and/or a willingness to make another meaningful contribution for the chosen level of service. DRA is an integrated approach to the water service delivery that takes into account technical, social, financial and institutional factors to ensure sustainability.

South Africa's policy supports many aspects of DRA (see para. 3.2), but in practice a capital cost for a fixed basic level of service (a communal tapstand, supplying 25 l/c/d, within 200 metres of households) is provided. This results in the majority of the projects being implemented in a supply driven approach. The designs for these projects do not consider or have very limited attention to, consumer preferences, and the local social (including the poor), physical, economic and institutional circumstances.

DRA requires a new approach to designing of rural water supply projects. Engineers need to design to meet the expressed demand, instead of engineering per set standard guidelines as used for a supply driven approach. This new role for the engineers requires:

- informing, assessing and responding to demand (through providing different technical options with matching cost, operation, maintenance and management);
- Acceptance that non-technical issues can determine technical issues;
- a view of the community as the client;
- consultation, communication, participation and decision-making with the community (as a whole, including the poor);
- acceptance and a close working relationship with a multi-disciplinary team, in particular the social consultant.

CONCLUSION AND RECOMMENDATIONS

This study investigated 4 aspects of adoption of DRA in the South African context:

- the gap between ideal characteristics (knowledge, skills and attitudes) of an engineer in DRA and existing characteristics of engineers in current approaches;
- the gap between ideal external factors for adoption of DRA by engineers and these factors at present;
- the engineers' views and attitudes to DRA;
- the feasibility of engineers adopting DRA in South Africa, when external influences and factors affecting the engineers are taken into consideration.

6.1.1 The gap between the engineer's characteristics in current approaches and DRA

The gaps between the existing characteristics and the ideal characteristics of the engineer are:

- **Inadequate ability to inform demand, assess demand and respond to demand;** Engineers have inadequate knowledge of and/or experience with: 1) appropriate technologies, 2) designing for a mixed level of service based on willingness to pay/contribute, 3) providing of options to serve the community (as a whole), and 4) enabling the community to take informed decisions. Present designs lack technical flexibility and adaptability, and individual consumer preferences, needs and abilities are not taken into account as willingness-to-pay and making of contribution surveys are not performed. At present the main focus of the project is infrastructure instead of people. The engineer lacks facilitation skills to guide a process of informing and decision-making instead of strongly advising the community as at present.
- **Inadequate ability to relinquish controls;** The majority of engineers find it very difficult to accept that non-technical issues can determine technical issues and not to interfere in the community participation and decision-making process. Most of these engineers feel that they know the communities and hence know what is best for the communities. Engineers often lead the projects and lack trust in other role-players, especially the social consultant.
- **Lack of common vision between the social and technical sides of project;** There is an inadequate understanding by engineers and social consultants of each other's roles and responsibilities at present and they are not exchanging and drawing on each other's information. The majority of engineers feel that social consultants neither understand water supply projects nor have the technical knowledge to facilitate these projects, which prevents a partnership and teamwork between them.

The identified gaps could be the result of the newness of the approach, as aspects of DRA might not be familiar to all engineers using the current approach. There is limited exposure to different type of approach and to what is happening in the water and sanitation sector nationally and internationally. Engineers who are more familiar with aspect of DRA are likely to have a 'resistance to change' as this is a recognised defence mechanism in normal professionalism. What could also contribute to the gap is the engineer's power, 'focus on things', control and sticking to standards as these are all recognised as parts of the deep preference of normal professionalism that influences the engineer's individual perception, choice and behaviour.

6.1.2 The gap between the ideal and external factors for adoption of DRA by engineers and these factors at present

The gaps between ideal external factors for adoption of DRA by engineers and these factors at present are:

- **Politics**; inadequate enabling environment to adopt DRA because of guidelines, targets and deadlines, and because of political promises and expectations.
- **Funding & Time**; the process of informing, assessing and responding to demand is an iterative process what will take time. Time is money, and at present not enough funding and/or time is allocated in the projects to carry out this process. Currently inadequate time and/or funding (which could result in lack of capacity) are allocated by funders to monitor the project implementation by engineers. There are no incentives for engineers to adopt DRA if they are not monitored.
- **Contracts and terms of references**; these are focused on the technical and infrastructural aspects of the projects and are not clear on exact responsibilities of the engineer, for example concerning community involvement. There is no incentive for the engineer to adopt DRA if there is no enforcement for them to do so.

6.1.3 The engineers' views and attitudes to DRA

DRA is a new term for the majority and the knowledge of this approach is limited among the engineers. Most of the engineers agree that the approach is likely to contribute to sustainability of rural water projects. About half of the engineers would like (partially) adoption of the approach and are willing to change (some of) their practices to do so.

Engineers identified that they could be assisted in their role to adopt DRA through literature, training, and seminars in the following areas:

- sharing of information and experiences between engineers;
- community dynamics;
- communication tools and techniques;
- information on what is happening in the sector including new technologies and approaches.

6.1.4 Feasibility of adoption of DRA in South Africa

A substantial gap has been identified between the engineer's role in the existing approach and the engineer's ideal role in DRA, and the majority of engineers are far from full adoption of DRA. It could be argued that this found gap does not matter in the South African context of water service delivery, as DRA is not formally adopted as an approach by most funders. Even the Mvula Trust, which has adopted DRA, is limited in constrained by national policies and politics at all levels. In the current environment the adoption of all elements of DRA is restricted by politics, restricting policies and guidelines, water services development plans, meeting of delivery targets and a fixed basic level of supply.

At present the water affairs minister, Ronnie Kasrils, is considering a scheme to offer South Africans a basic amount of water **free** of charge. This free 'lifeline' scheme could give a different focus to the water service delivery in South Africa. Adoption of this

CONCLUSION AND RECOMMENDATIONS

scheme would mean that DRA, in the sense of only establishing a willingness-to-pay is no longer an appropriate approach to the water service delivery. If the government policy is to subsidise fully a basic level of service then demand still needs to be ‘captured’ in order to encourage a sense of ownership and associated managerial responsibility that will lead to enhanced sustainability.

District Councils will be responsible for provision of basic services. As these councils are relatively new, they have limited experience and capacity in implementing water supply projects and their approach is based on a supply driven, top down approach, it is doubtful whether they understand the challenges of providing affordable, appropriate, sustainable services. In order for them to adopt DRA, it is crucial to transfer the lessons learnt in the sector by DWAF and its implementing agents such as Mvula Trust. Otherwise the same mistakes will be made and the same approaches, that have proven to fail in the past, will be used.

The adoption of DRA faces many challenges and bridging the gap for engineers between the existing and ideal situation might be impossible, making DRA inappropriate. However, engineers could improve and adopt many aspects related to DRA in their current approaches to water service delivery and so improve the chances of sustainability. Therefore recommendations are drawn up to narrow this gap between the existing and ideal situation, and hence to increase chances of sustainability in the rural water supply projects in South Africa.

6.2 Recommendations

Recommendations are drawn up to enable the engineers to adopt and improve DRA aspects and to create a more enabling environment to stimulate this process. In order for the engineers to adopt and improve DRA aspects, awareness should be created concerning the reasons for this change. The recommendations in this chapter are based on the literature, analysis of the interviews (Chapter 5), identified assistance by interviewees (para. 5.1.3.4), individual recommendations by interviewees and analysis of this study by the author.

6.2.1 Awareness creation

Awareness of DRA and related issues could be created through:

- open debates regarding different approaches;
- specific forums to share information about approaches taken to projects;
- sharing of case studies of good and bad practices through literature and workshops;
- e-mail distribution of a monthly document containing new publications and relevant website addresses regarding current issues in the water and sanitation sector;
- professional magazines and newsletters.

6.2.2 Training

Short term

The engineer’s knowledge, skills and attitudes towards DRA could be improved by training through seminars and workshops on:

- community dynamics, perceptions, economics, affordability (people's orientation);
- sustainability factors (wider than cost recovery);
- appropriate and user-friendly technologies;
- establishing willingness to pay and provision of relevant options;
- facilitation techniques;
- participatory approaches;
- communication techniques.

Training should take into account the present limited knowledge of engineers concerning. It will be very important to acknowledge the professional status of the engineers for training to be accepted by the engineer. The training sessions must be designed carefully and there should be plenty of opportunities for the engineers to share their experiences and to participate in the training. In order to reach the engineers, a respected peer, a 'converted' engineer who has adopted DRA, should conduct the training. This engineer is likely to understand sensitive issues, to talk the same language and to understand the problems engineers are facing in the projects. This recommendation was favoured by many of the interviewees.

Macdonell (2000) suggests a completely different approach in comparison with existing workshops and presentations directly focused on water supply. He believes that, for example, case studies must be drawn away from the rural water supply. The case studies must hold a clear message, which will be conveyed. When this message is understood, the case study should be linked back to the rural water supply. To engage the engineers fully in the process, the case study should challenge them. Such a method would be a non-threatening way of learning for the engineers who have the greatest resistance-to-change (para.5.1.4.2).

A different way of training the engineers could be a much more on-the- job training. This could be done through a mentorship by the funding agent. The engineer and the funding agent could develop a monitoring and evaluation system. Strict monitoring needs to happen to correct the engineer in his/her approach. This will only be feasible if there is mutual trust and understanding between the engineer and the funding agent and when the funding agent has the capacity to take on this task.

Individual organisations that are adopting DRA should develop a human resources strategy (including funds) that enables the engineer to develop his/her knowledge, skills and attitudes.

Long term

The most likely way for engineers to adopt DRA aspects will be when they have been formally taught about them in their education. Engineering courses at college or university level in South Africa should become more focused on people and development, and less on first world development, as there is a great role for engineers in the development of South Africa. The courses should offer specific modules focused on issues like water supply and sanitation and/or development issues. To attract a new generation of engineers working in the rural water supply incentives, such as scholarships or career guidance, should be provided for technical development studies (Smits, 2000).

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6.2.3 Improvement in relationship between engineers and social consultants

The relationship between the engineer and social consultant needs to be improved by creation of understanding between these role-players. This could be achieved through:

- workshops to create understanding through exercises of role exchange between role-players. Both role-players will discover each other's problems and threats;
- training on development issues for engineers and social consultants to create a common vision for the projects;
- development and enforcement of technical training courses (by funders) for social consultants to increase the understanding of the projects;
- discussion and communication about the project beyond monthly meetings.

6.2.4 Policy and guidelines

Policy and guidelines should stimulate the adoption and improvement of DRA aspects. In order to do so:

- policy and guidelines should move away from supplying a basic level of service and should become more supportive of DRA;
- guidelines should be flexible and adaptable to implement DRA;
- guidelines and manuals to assist the engineers in the DRA process, should be developed, distributed and advocated by the funders;
- current guidelines that support DRA aspects (such as DWAF's institutional and social development package) should be more widely advocated and enforced through monitoring.

6.2.5 Contracts

Contracts could provide a framework for adoption and improvement of DRA if:

- contracts where the engineers' fee is based on a percentage, are revised and abandoned. These contracts provide incentives for highly engineered infrastructural works;
- contracts are staged (instead of a contract for the full work), or outcome based. This will ensure increased responsibility towards sustainability of the projects by engineers;
- contracts are clear on roles and responsibilities of the engineer. The contract should discuss what work needs to be done and how it needs to be done. It should still be flexible enough to allow DRA, but should state the process of how things need to be done.
- contracts stated the engineer's responsibility for sustainability of the project for a defined period. This will ensure increased responsibility towards sustainability of the projects by engineers. The contract should be very clear, as sustainability is not only dependent on the engineer.

6.2.6 Who should advocate DRA and create awareness about the approach?

The Mvula Trust has an appreciation of DRA and the South African water sector. Therefore the Mvula Trust could play a large role in the advocating and awareness creation of DRA at policy and implementation level. They could also provide certain training in the sector to enable different role-players to adopt and improve DRA aspects. Contribution from DWAF to the advocating and awareness creation of DRA will be very important as they have status in the South African water supply sector.

6.3 Limitations and further research

A significant amount of government funding is allocated to the water sector in South Africa. It only became recently evident that attention has only focused on building of infrastructure, instead of appropriate affordable technologies that can be maintained, operated and managed. It is recognised by different funders that focus in projects should be changed from infrastructure to sustainability. Institutional and social development has become integrated in the projects (at least on paper). Not much attention has been focussed on how role-players should adapt their role in order to increase sustainability in projects. This study is focused at the role of engineers in adopting DRA to increase sustainability of rural water supply projects in South Africa.

6.3.1 Limitations

Limitations of this study are the single focus on:

1. Approaches taken by engineers.
 2. Rural/peri-urban water supply.
 3. The South Africa water sector context.
- a multi-disciplinary approach is needed to adopt DRA. This study has focused on engineers as they play a very important role in the water service delivery and their voice has not been very often. It is recognised that social consultants and other role-players have a very important role to play but, because of size and time frame of this study, these have not been looked at in detail. The study has not looked in depth at financial and institutional aspects of adoption of DRA;
 - sanitation is regarded as equally important as water projects to achieve health improvements. For simplicity this study has only focused on water supply;
 - this study gives an example of engineers in the South African water service delivery context. South Africa has many similarities, but also many differences with other developing countries because it also has parts that have been fully developed. Lessons learnt might differ from other developing countries. This study has only focused on South Africa because of time and size of the work.

CONCLUSION AND RECOMMENDATIONS

6.3.2 Further research

For adoption of DRA in the South African water sector further research is needed:

- into the role of the social consultant and how the social consultant could be assisted in his/her role;
- into how policies and guidelines can become more suitable for adoption of DRA;
- into the role funders and other institutions have to play in order to create an enabling environment for the adoption of DRA.

A similar study from a different country could produce different results for reasons outlined in para.6.3.1. Limited research has been carried out into the role of the engineer globally; therefore a comparative study would be useful to provide an insight to the engineer's knowledge, skills and attitudes towards demand responsive responses wider than South Africa.

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Appendix

Interview structure for the engineer's interviews

The role of the engineer interviews

Date: 2000

1. Name		
2. Organisation		
3. Job Title/ Responsibility		
4. Type of organisation	• Government	
	• NGO	
	• Consultancy	
	• BOTT	
	• Other	
5. Scope of projects	• Water only	
	• Sanitation only	
	• Water & Sanitation	
6. Type of projects	• Rural	
	• Urban	
	• Peri-Urban	
	• Other	
7. Funding of projects	• DWAF	
	• EU	
	• Mvula Trust	
	• Other => Local Government	

THE ROLE OF ENGINEERS IN DRA

8. In what stages of the project delivery are you involved?:	• Identification	
	• Feasibility	
	• Design	
	• Implementation	
	• Operation & Monitoring	
	• Possible Extensions or preparing next phase	
	• Policy development, sector planning	

9. What do you think are desirable job qualifications to work on community water and sanitation projects? (1) most desirable (2) desirable	Experience:	• Water Supply	
		• Sanitation Supply	
		• Other community projects	
		• Working with NGOs or government	
		• Management	
		• Team working	
		• Resource organisation	
	Skills:	• Computer literate	
		• Facilitating skills	
		• Participatory techniques	
		• Administrative skills	
	Knowledge:	• Regarding main problems in watsan project	
		• Sustainability of project	
		• Participatory training	
	Attitudes:	• Allowing for participation and shared decision making	
		• Gender awareness	
		• Perceptions to poor	
		• Commitment to development	
		• Empowerment	
	Interests:		
Any other desirable skills:			

10. Which role-player leads the project and keeps it moving from the feasibility stage onwards?	The Community	
	The Engineers	
	The Social Consultant	
	The Mvula Trust	
	The local government	
	An other involved party	

INTERVIEW STRUCTURE FOR THE ENGINEER'S INTERVIEWS

Why:		
11. Do you believe that projects driven by engineers are likely to have problems in terms of sustainability in future?	There is no problem	
	There may be a problem but I cannot do anything about it	
	Yes, there is a problem but I doubt if we could do anything about it	
	There is a problem, but I do not think any other role-player can drive the project. (it should be a team but engineers should lead)	
	I see the problem and I want to learn and take action on the projects	
	I am willing to demonstrate the solution to this problem and advocate change	

Discussion topics

General

- how do you see your role in the water projects?
- what does influence your role?
- who is your client?
- in what kind of role are the women involved in your projects?

Technical Choices

- what kind of technical choices do you offer the community? Have you got any example?
- how were these choices presented?
- was the design changed because of the feedback?
- where is the decision of what level of service people get based on?
- what training do you provide to the community?
- what do you understand by appropriate technologies?
- have you ever used low cost appropriate technology?
- how do you feel about non-technical issues influencing technical issues?
- how do you include the poor in the projects?

Participatory Approaches

- have you heard of participatory approaches?
- how do participatory approaches apply to you? Do you believe in them?
- which participatory approach have you ever used? How did it work?

Demand Responsive Approaches

- what do you understand by a demand responsive/driven approach?
- have you heard of willingness-to-pay?
- do you measure any contribution at the beginning of a project?

“Definition” of Demand Responsive Approaches

- how could this approach be integrated in the work of engineers?
- what role would there be for an engineer in this approach?
- would you be willing to adopt a different role in a project and inform the community on different technical options, cost and management, so that they can make decisions?

Benefits and Constraints of demand responsive approaches

- what would be benefits of using this approach? Why?
- what would be constraints of using this approach? Why? How could these be overcome?

Implications of demand responsive approaches

- what would be implications for the engineer to carry out this approach? Why? How?
- who could engineers work with to make their role easier in a DRA approach?

Communication

- communication structure with the community? other role-players?
- do you feel that you are aware of policies on the project? Why (not)?
- do you hear about different developments on different approaches?
- what could be done to inform you on policies, approaches, techniques, etc.?

Possible assistance

- is there any way you could be assisted, in terms of training or education to help you as an engineer fulfilling your role on community water projects?