

## **EXECUTIVE SUMMARY**

### **Introduction**

This project was proposed in 1995 to investigate methods to improve the flow of information relating to water supply and sanitation infrastructure in rural areas of South Africa. The initiative to provide water services to much of the population that had not had those services in the past faced an enormous task of identifying priority areas that required and desired new water systems and of operating, maintaining, and evaluating existing systems and new systems being installed. The size of the task - to supply water and sanitation services to approximately 14 million people - required the creation of an organised system of information flow where minimal information was initially available. An effort to identify information needs and describe systems to collect and disseminate the information was identified as a vital first step in the information system that would support the related decision-making processes.

The project was conducted during a time of rapid and dramatic changes in the water services environment in South Africa. Major national effort was focussed on water services delivery and crucial decisions made by central government affected many ongoing projects. As custodian of the national water resource, the Department of Water Affairs and Forestry (DWAF) led the initiative to create the framework within which delivery would occur. That framework included the design of a database for water services delivery in rural areas. While close contact with all other initiatives was attempted during this project, the extent and speed at which development occurred hindered effective overall coordination and communication. The project maintained an overall objective of village level empowerment supported by ongoing information flow.

### **History**

The concept of this project arose from the following two separate project ideas proposed to the Water Research Commission in 1995:

A proposal to develop a comprehensive information system to assess the progress and impact of implementation of the RDP programme within the Department of Water Affairs and Forestry.

Two primary aims of the proposed project were (1) to develop key performance indicators that would enable decision makers to assess the success or problems associated with the implementation of the RDP water supply and sanitation projects and (2) investigate ways of ensuring the information is collected and analysed efficiently.

A proposal to develop community based information and monitoring systems linked to district and regional role players.

The primary aims of this proposal were (1) to provide communities with procedures to gain information about their own situation so that decision making could be informed and relevant; (2) to enable communities to know their position in relation to other communities within their districts and to be kept informed of all water and sanitation related activities within the area; (3) to enable early warning of pending drought impacts or problems arising from breakdowns. District and regional authorities would also have more knowledge and control if all the community based systems were able to be linked through district and regional offices.

The Water Research Commission requested that the two proposers combine their respective proposals with a more moderate budget. The outcome was this project that aimed to include some of the pertinent aspects of both proposals.

## **Aim**

The aim of the project, as stated in its proposal, has been:

To develop a pilot GIS database on community water and sanitation provision and investment in a sub-region of Northern Province, South Africa, **which assuming successful implementation will be replicated countrywide.**

The aims of developing the database are to assist:

- ▶ decision makers to plan and prioritise the water and sanitation needs of the region;
- ▶ communities to increase their level of involvement in and awareness of being an integral part of the overall development initiatives in the country, with a concomitant increased level of commitment and responsibility;
- ▶ in the development of an early warning system at the local or provincial level to detect water and sanitation problems within an area or specific community (this will include problems arising from the onset of drought, the loss in efficiency of equipment, the breakdown of system components, or potential health hazards); and
- ▶ decision makers to monitor implementation progress, implementation constraints and the effectiveness of different investment policies.

## **Planned methodology**

The methodology planned for the project comprised the steps listed below.

- ▶ **Establish the existing situation, both locally and internationally**
- ▶ **Develop specifications for the database portion of the information system**
- ▶ **Develop data collection procedures emphasizing contributions at village level**
- ▶ **Implement the data collection procedures on a pilot scale**

Institutional aspects of the data collection activities were to be a major focus of the project. The numerous levels of government involvement in water supply and sanitation require that coordination of the efforts receive attention.

## **Impacts on planned methodology**

Initial project planning gave way to a large extent to forces beyond the control of the project. The original intention was to have database specifications early in the project, then spend the majority of the time populating the database with actual data collected during the pilot study. The development of other software systems removed the necessity to proceed with this database design, but the priority remained the establishment of procedures and demonstration that a village level focus was appropriate for the data collection and subsequent information use efforts.

## **WasamS**

The international situation was assessed through a literature review of databases developed and applied in similar situations internationally. A search was conducted specifically for any existing information system software programs that appeared to be able to be used, either as developed or with minimal modification. Learning about potential obstacles encountered in those earlier experiences that could also occur in South Africa's situation would be a second major focus of the literature review.

When the literature survey was carried out, it appeared that the WasamS (water and sanitation monitoring system) developed jointly by the World Health Organisation (WHO) and the United Nations Children's Fund (UNICEF) was the only holistic monitoring programme developed specifically for the water and sanitation sector.

## Water Supply and Sanitation Policy White Paper

The Water Supply and Sanitation Policy White Paper published in November 1994, was examined to establish South Africa's policy and inferred expectations relating to information systems and to confirm the policy and institutional framework within which the pilot study was to be implemented. A number of specific information needs were explicitly identified in the policy statement.

### Conclusions from the literature survey

There is a very real need for the type of pilot study planned as part of this project and for further development of a WasamS type water and sanitation management tool that can provide relevant decision support in South Africa.

Examination of the November 1994 Water Supply and Sanitation Policy White Paper confirms that the Department of Water Affairs and Forestry seeks to develop a comprehensive National Information System within a framework which puts the community first.

Developments since the beginning of the project, in March 1995 indicate that the most urgent needs are for field trials in rural areas. The field trials should be integrated into and influence existing software development initiatives rather than develop additional software.

## The database design specification

Discussions with stakeholders, primarily in DWAF, produced agreement on a number of issues, including priorities of information needs that were agreed with DWAF's Northern Province staff. A long list of possible data sets were ranked by participants at a workshop and the most important for the largest number of participants selected. **Table 1** lists the eight data sets ranked highest in importance.

**Table 1.** Data sets ranked by staff in DWAF's Northern Province

| Rank | Data Set  |
|------|---|
| 1    | Names and locations of settlements  |
| 2    | Water supply infrastructure: number and location of schemes               |
| 3    | Domestic water demand   |
| 4.5  | Available water resources   |
| 4.5  | Population of settlements   |
| 6    | Socio-economic infrastructure; (for example, entrepreneurial initiatives) |

|   |   |
|---|---|
| 7 | Water demand by sectors other than domestic                 |
| 8 | Institutions involved; roles and relationships between them |

Based on the Northern Province meetings and the initial work in developing data gathering forms, a draft design specification for a database was provided.

The specifications describe the functional design, the data form procedure, and the database design. Detailed instructions are provided for each function and cover screen layouts, menu functions, access functions, mouse functions, and report and form layouts. Database programming is in Oracle.

Because of other water and sanitation database initiatives that have taken place since March 1995 (see section 3 for details) the design specification was not developed further as part of this study and no computer programming was carried out. The specifications remain valid in general for any database system used to report water services information.

## **Stakeholder Consultation**

During June 1997, one day regional workshops were held in Pretoria Gauteng, Bisho Eastern Cape, and Pietersburg Northern Province with representative groups of stakeholders to share thoughts and ideas on integrating regional water and sanitation database initiatives into a National plan. The "Proceedings" of these workshops have been issued as a separate report (CSIR, 1997) Participants at the workshops concurred that the pilot study was addressing the appropriate objectives but expressed a number of concerns about the resources being used to implement and integrate it into other initiatives.

Major benefits seen by the participants were the emphasis on sustainability issues and strengthening institutions from village level to central government. Warnings issued at the workshops included the need for substantial human and financial resources to complete a study that requires the iteration necessary in the current study, the need to provide sufficient capacity in the villages to sustain the information gathering initiatives, and the need for extensive networking to ensure dissemination of the lessons learned during the course of the project.

## **Data Collection Procedures**

Before any field work was undertaken on the project, the Department of Water Affairs and Forestry (DWAF) was approached as the central government stakeholder to ensure that the project was integrated with their longer term aims of developing an

information management system. Part of the interaction included a series of planning meetings held with DWAF Northern Province. The Office of the RDP Commission Northern Province also participated in the discussions.

Initially DWAF expressed concern about the likelihood of the pilot study raising community expectations with respect to upgrading services within the community. However, it was agreed that the project would be useful to DWAF as a pilot study for improving their community water supply maintenance back-up services. As a result, a general strategy for liaising with representative community structures and for discussing the pilot study with them was planned and agreed with DWAF.

### Data forms

The survey instruments consist of four “layers” of data, namely the core data form, the quarterly monitoring reports, the major water supply or sanitation breakdown report, and the water supply and sanitation services “hardware” data forms.

A sufficient number of the data gathering forms were drafted and used to begin the pilot study. The draft forms were forwarded to the DWAF and RDP Northern Province offices for comment.

### Use of the Information

The following tables indicate how this information can be used at various levels for decision making and/or to support planning activities.

**Table 1** Suggested uses by various groups of the data/information generated in the proposed information system

| INFORMATION                           | USE BY COMMUNITY                             | USE BY O&M STAFF  | USE BY PLANNERS  | USE BY OTHER DECISION MAKERS   |
|---------------------------------------|--|---|--|--|
| <b>1. Core data form</b>              |  |   |  |  |
| Basic community data                  | Planning and project proposals               | Location and population size - useful for dealing with O&M problems | Vital for planning (more accurate data)                    | Monitoring by TLC  |
| Community institutional capacity      | List of skills - planning and implementation | Contact persons and skills base is vital for good O&M               | Contact persons and skills base is vital for good planning | TLCs require contact persons and skills base                             |
| Water sources and supply improvements | Decision making and planning                 | Time and capital expenditure savings with use of this information   | Decision making and planning                               | Working towards equity of services and knowing what assets are available |

## Water and Sanitation Information Pilot Study

| <b>INFORMATION</b>  | <b>USE BY COMMUNITY</b>  | <b>USE BY O&amp;M STAFF</b>                                       | <b>USE BY PLANNERS</b>                                | <b>USE BY OTHER DECISION MAKERS</b>                                      |
|---|--|---|---|--|
| Access to health and sanitation                               | Decision making and planning                                   | Time and capital expenditure savings with use of this information | Decision making and planning                          | Working towards equity of services and knowing what assets are available |
| Community's evaluation of their water and sanitation services | Develop plans and strategies to improve the standard of living | Target awareness campaigns and O&M strategies                     | Target awareness campaigns and development priorities | Target development priorities  |
| <b>2. Quarterly monitoring reports</b>                        |  |   |   |  |
| Water usage   | Monitor and control consumption                                | Identify problems   | Demand management planning                            | Water resource assessments   |
| Cost recovery   | Assess tariff system and viability of system                   | Target community awareness campaigns                              | Assess viability                                      |  |
| Breakdowns  | Structure maintenance team                                     | Identify and plan for major interventions                         | Assess viability of equipment and systems             |  |
| <b>3. Hardware data forms</b>                                 |  |   |   |  |
| Pump and engine   | Spares and maintenance   | Enhancing performance and reporting                               | Monitoring performance                                |  |
| Other   | Spares and maintenance   | Enhancing performance and reporting                               | Monitoring performance                                |  |
| <b>4. Household registers</b>                                 |  |   |   |  |
| Household lists   | Planning, tariff collection, and poverty alleviation           |   | Planning  |  |

## **Implementation of the pilot study**

### **Location of the pilot study area**

Agreeing on the location of the pilot study proved a major problem. There was particular concern about the implementation being seen as favouring one district at the expense of others. The area finally selected is in the centre of Northern Province and combines parts of Northern, Lowveld and Central Districts. The area includes communities supplied with water from bulk surface water schemes and others supplied from ground water schemes serving individual communities. It is suspected that overall there is some surplus capacity in the former schemes whilst the overall quantitative adequacy of the ground water schemes is in doubt. The study area comprises about 120 communities with a population probably in excess of 100 000. The boundary is roughly a triangle bounded by Elim, Soekmekaar and the confluence of the Klein & Middel Letaba Rivers.

### **Summary of Community Characteristics**

Data analysis from the pilot study area shows that additional skills development appears to be needed to help ensure that villages are able to operate and maintain water systems adequately. In particular, more people with plumbing, bookkeeping, and pump care-taking skills are likely to be needed. Some misunderstanding of central government policy on local involvement in water systems appears to exist since most respondents expected additional capacity for water system maintenance to be supplied by DWAF. Little need for additional capacity in cost recovery was expressed, indicating a need for additional understanding of the role of financial management in operating sustainable water systems. Awareness of the focus on women's representation on water committees appears to be needed to increase representation in about half the villages to the recommended minimum of 30% women.

### **Water Adequacy Criteria**

Water inadequacy ranking of communities in each of the three sections of the pilot study area were estimated. The water adequacy criteria are included as part of the "decision-making" criteria framework. Evaluation of the adequacy is given by the sum of the four measures, access to water, quality of supply, quantity of supply, and reliability of supply.

Total scores are evaluated as:

- ▶ 0-25 - acceptable provision
- ▶ 25-50 - poor provision
- ▶ 50-75 - severe under-provision
- ▶ 75-100 - critical under-provision



The overwhelming majority of villages are in the category “severe under-provision” for water delivery. A few villages, 9 of the total of 74, were in the “critical under-provision” category and 5 ranked in the relatively high “poor provision” category. No villages were ranked as having acceptable provision of water.

This input illustrates the urgent need for a broader interpretation of what is required to achieve adequate water service provision at community level.

### **Sanitation Adequacy Criteria**

Estimated sanitation and hygiene inadequacy ranking of communities in each of the three sections of the pilot study area were evaluated. The evaluation is similar to that for water adequacy. The sum of the four measures, sanitation hygiene, waste disposal, disease exposure, and latrine access, is used as the overall indicator using the scale:

- ▶ 0-25 - acceptable environment
- ▶ 25-50 - inadequate environment
- ▶ 50-75 - severely inadequate environment
- ▶ 75-100 - critically inadequate environment

The measurements illustrate an inadequate environment throughout most of the area. The south east section, which is marginally best off in terms of water adequacy, is marginally the worst off in terms of its sanitation and hygiene environment. The overwhelming majority of villages are in the category “severely inadequate environment” for sanitation and hygiene. A few more of the villages than in water adequacy provision, 12 of the total of 74, were in the “critically inadequate environment” category and only 5 achieved the “inadequate environment” category. No villages were ranked at an acceptable level of sanitation and hygiene.

## **Discussion and conclusions**

### **Guidelines on village level information systems**

The following points may be used as draft guidelines for the development of community based information systems:

- ▶ Plan and develop the information system with representatives of the communities involved.
- ▶ Ensure that all information gathered at the local level is useful at the local level (and is not just for higher level structures).
- ▶ Data collection forms must be simple and understandable, and at the same time enable easy estimation of performance based on key performance indicators.

A system to improve sustainability of water system must take the following into account:

- ▶ work through problems with communities so they observe that the project improves their lives
- ▶ complete the building up of the set of internal water scheme monitoring and management forms so that the community can collect information for quarterly monitoring reports
- ▶ work with communities to improve their operation, caretaking and management skills
- ▶ provide training in general budgeting, bookkeeping, and financial management, including the role of cost recovery
- ▶ liaise with DWAF, Local Government and other stakeholders in the area to plan a strategy for carrying out minor and major maintenance repairs

### **Completion of project aim**

The aim of the project has been met with the exception of the inclusion of a geographical component in the database. While the countrywide replication has not been achieved, considerable progress has been made in understanding the information needs of communities so they can operate and maintain their water services systems in an effective and sustainable manner.

The core data forms have been designed to elicit information that will assist decision makers to plan and prioritise the water and sanitation needs of the region. The water adequacy and sanitation hygiene adequacy criteria will enable ranking of individual villages to provide more consistent prioritisation.

Focus of the data collection effort at village and community level has assisted communities to become more involved in their own development and, by providing additional information on conditions in similar villages, has assisted each village to become more aware of other development initiatives in the country.

The on-going data collection efforts will provide a more accurate assessment of potential problems related to loss in efficiency of equipment, breakdown of system components, and potential health hazards related to sanitation and hygiene conditions. This additional information will be invaluable in planning drought mitigation activities for the region.

Implementation of the procedures developed in the project will provide sufficient information for decision makers to monitor implementation progress, implementation constraints, and the effectiveness of different investment policies. In addition, the decision makers will be in a better position to evaluate which conditions lead to sustainable water systems and in which villages those conditions exist.

A sound foundation for a community water services database has been developed in this project. Considerable progress has been achieved in defining appropriate content of the database. Input from information users at community level through central government level has been incorporated in the recommended database content and implemented in the field study in the pilot study area. An initial analysis of data collected in the field study has demonstrated that the content produces useful information. The success of the data collection effort at village level has demonstrated that the concept is feasible and can enhance the sustainable operation and maintenance of the water systems, if approached correctly.

## Recommendations

The conclusion that must be drawn as a result of many complex forces acting in the water services database development arena at this time is that the data collected during the course of this project should be used where possible. The data are available at WRC, DWAF Head Office, DWAF Northern Province, and should be accessible to the villages that participated in the pilot study.

However, further development of software associated with the database design specifications should not be continued as an isolated project. Efforts are being undertaken elsewhere to ensure that the technical aspects of storing and retrieving data are well in hand. However, the progress achieved in this project in terms of understanding data needs and constraints to data collection at village level should be incorporated in any further information system development. In order to make the data collected in South Africa more generally accessible, consideration should be given to ensuring that it is possible to output data from any water and sanitation database developed in South Africa to WasamS, the database developed by WHO and used more generally in international settings.

Further effort should be focused on contributing to existing databases, either in populating the database or in aggressively using the data for decision-making and insisting that the data provided is adequate, accurate, and appropriate.

The procedures developed here to include village level participation in data collection and use should be extended to other regions of the country. Additional effort should be focussed on providing an efficient and effective flow of information through the circuit that includes the villages, regional water institutions, provincial government structures, and central government structures.