ALL TOWNS WATER RECONCILIATION STRATEGIES IN THE WESTERN AND EASTERN CAPE – ACHIEVEMENTS AND CHALLENGES

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ABSTRACT

The Department of Water and Sanitation (DWS) began the development of water reconciliation strategies for towns, villages and clusters of villages in 2008 and concluded the first phase in 2011. Phase 2 started in 2012 and its aim is to monitor the progress with the implementation, and to support the maintenance, of these water reconciliation strategies for all towns and villages.

Recommended interventions to improve the water supply situation include implementing water conservation and water demand management measures; upgrading existing water infrastructure; groundwater and surface water development; water trading; re-use of water; desalination of sea or brackish water; and rainwater harvesting.

The available data and information for monitoring and evaluation of the implementation of the strategies differ significantly between the provinces, and between individual towns. The implication of the differences is that the monitoring and evaluation process for most reconciliation strategies in the Western Cape runs smoothly, while the difficulties of collating the relevant data persist in the Eastern Cape. Hence, the quality of the output and the detail of the evaluation of the progress of implementation differ significantly.

This paper reports on lessons learnt from the development and implementation of these water reconciliation strategies in the Western Cape and Eastern Cape provinces, in studies undertaken on behalf of the DWS.

INTRODUCTION

The Department of Water and Sanitation (DWS) initiated a nationwide program aiming at ensuring that all South African towns and villages will have access to sufficient and sustainable water supplies well into the future. This complements a similar program, started in 2005, for metropolitan areas and the large bulk water supply systems, as the need for water reconciliation strategies was identified in the 1st Edition of the National Water Resource Strategy (NWRS, 2003). The DWS initially began the development of water reconciliation strategies for towns, villages and clusters of villages in 2008 for all four planning regions of the Department and concluded the first phase in 2011. Within the Southern Planning Region, comprising the Eastern Cape and Western Cape provinces, 259 strategies and 12 summary reports were produced (one for each of the 10 District Municipalities and one each for the two provinces).

The development of reconciliation strategies for towns and village clusters focused on existing water resources and supply schemes, and considered both current and expected future water requirements, along with the potential water resources available to meet these growing requirements. The strategies are aimed at reconciling water requirements with water resource availability, with the water resource management / development interventions necessary to achieve this objective the primary focus of the strategies (Thompson et al., 2011). Scenarios were developed and evaluated and recommendations made for the purpose of ensuring a positive water balance and sustainable management of water resources, based on a planning horizon of 25 years (see Figure 1).
The current strategies comprise an executive summary, a calculation of current and future water requirements (based on high, medium and low-growth scenarios for population growth foreseen), information regarding non-revenue water and the status of current infrastructure, as well as possible interventions and other actions required to improve the water supply and water services situation for the town. Recommended interventions to improve the water supply situation include implementing water conservation and water demand management measures (to reduce losses and wastage); upgrading existing infrastructure (including water treatment works and wastewater treatment works) where necessary; groundwater and surface water development; water trading, re-use of water where feasible; desalination of sea or brackish water where applicable; and rainwater harvesting, where feasible.

![ANNUAL WATER REQUIREMENT SCENARIOS VERSUS CURRENT AND POTENTIAL YIELDS](image)

**Figure 1:** Water requirement scenarios, current water availability and possible interventions.

The main aim of this paper is to provide feedback to the different stakeholders, i.e. the DWS, Provincial departments, Catchment Management Agencies (CMAs), water boards, municipalities (WSAs) and Water Services Providers (WSPs) on the successes achieved and challenges in implementing the strategies designed to ensure sufficient and sustainable water supply for the towns. For example, it is critical that the start dates for commencement of required studies and/or interventions are being communicated to the WSAs and the implications and risks of not implementing projects or interventions timeously highlighted.

**APPROACH TO MAINTENANCE OF RECONCILIATION STRATEGIES**

In late 2012, the DWS began a programme to monitor the progress with the implementation, and to support the maintenance and update, of these water reconciliation strategies for all towns and villages. The overall objective of the project is stated in the terms of reference as:

*Systematic maintenance and improvement of water resource reconciliation strategies so that these strategies remain relevant, technically sound, economically viable, socially acceptable and sustainable; thus enabling their implementation in the local government planning instruments (Water Services Development Plans and Integrated Development Plans). The study is also to provide support with strategic interpretation of the additional water required in the strategies and to develop a separate strategy for proper communication of the strategies and their contents to Water Services Authorities (WSAs).*
The implementation and maintenance of the current reconciliation strategies forms the core of the work, supported by several tasks structured to assist with the monitoring and evaluation of progress as well as supporting the implementation of the strategies at municipal level (see Figure 2). The required activities are:

- Ongoing liaison with the WSAs to support the implementation and receive feedback about any issues related to the strategies;
- Collating data and information related to the strategies in a specially designed information database;
- Review of technical documents and policy with respect to their impact on the strategies;
- Monitoring and evaluation of strategy implementation and its impact;
- Updating of information on water requirements and water availability and subsequent update of the strategies, where this is required;
- Regular reporting of changes to strategies and/or status of implementation.

The progress in implementing the strategies is monitored in three ways:

- actual water consumption and water losses, or non-revenue water, as indicator for growth scenarios and implementation of WC/WDM measures;
- timeous initiation of and progress with studies and implementation of interventions to increase water availability if and when required; and
- required actions such as infrastructure upgrades and obtaining institutional agreements (e.g. licensing or authorisation of waterworks or water uses).

The evaluation further focuses on the development and successful implementation of WC/WDM strategies and the implementation of the recommended interventions, such as groundwater development where appropriate, water re-use, desalination and rainwater harvesting. Some of the relevant factors that are considered and reported on are deteriorating water quality of the resource, potential effects of climate change, significant changes in electricity costs, and new or improved technologies becoming available and affordable.

Figure 2: Data and information flow between the three pillars (i.e. Administrative Support, Strategy Implementation & Maintenance, and Technical Support) and through the cycle of Monitoring & Evaluation
One of the recommendations of the All Towns Reconciliation Strategies study was that Strategy Steering Committees (SSCs) should be formed, with a clearly defined mandate and scope of work. The main function and objective of the Strategy Steering Committee is to “monitor the effectiveness and efficiency of the adoption and implementation of the reconciliation strategies within the specific province and provide guidance and direction towards improving the implementation of the strategies”.

The SSCs relevant to the All Towns Reconciliation Strategies for the Southern Planning Region were established for the Western Cape and Eastern Cape provinces. The SSCs include key stakeholders involved in water resources management such as officials from the DWS's regional and national offices, Water Boards, Catchment Management Agencies, relevant DMs and LMs, and Provincial Government departments.

UPDATING OF STRATEGIES

It is important that the strategies remain up-to-date with respect to the best information currently available and that the recommended reconciliation options and future interventions take into account what has been done and/or what circumstances have significantly changed. However, in many instances it might not be necessary to update the complete strategy, but rather issue an amendment with significant changes listed on an extra page.

The updated strategies comprise the same structure/template as the original strategies. However, only the sections are updated and highlighted, where the information in the original strategies has changed significantly.

The focus of the update of the strategies is on the following aspects:

- Updating water requirement scenarios
- Updating / confirmation of available yield from all the available water resources
- Expanding implementation of water conservation and water demand management (WC/WDM) measures
- Incorporating results and recommendations from RBIG, MWIG, ACIP and other relevant studies, where these have been completed and approved
- Evaluation of downstream impacts of any interventions implemented or recommended for implementation.

Updating water requirement scenarios

The original water requirement estimations were mainly based on available population data, water use patterns (where available), and information on planned developments. If better data and information for any of these three elements became available, the water requirement scenarios are updated.

The detailed population data obtained from the 2011 Census are compared with the population figures used in the original strategies (based on the 2001 Census population projected to 2009) to identify significant discrepancies that would impact on the water requirement calculations or estimates.

The effort by the DWS and some municipalities to install proper metering systems to measure and monitor the actual water abstraction and consumption allows in some cases for a comparison with the water requirement estimates. In cases where the actual consumption deviates significantly from the original estimates and it is higher than the high water requirement scenario, the reasons for the increase is investigated and the water requirement scenarios updated, if the deviation is found to have a reasonable basis.

Updating / confirmation of available yield

The available yield of dams or run-of-river abstractions for a number of strategies were assumed, based on available but sometimes conflicting information. Hence, there is a need for a revision of the yields for selected stand-alone dams, some of which became available since from the study “Development of Operating
Rules for Water Supply and Drought Management for Stand-Alone Dams/Schemes” (DWA, 2013a), currently being undertaken by the DWS.

The need to develop and implement drought operating rules are clearly defined and emphasized, especially in cases of conjunctive use schemes and smaller dams. However, the development of the operating rules is not part of this study, but the cases where this is urgently required are identified.

**Water Conservation and Water Demand Management (WC/WDM)**

It appears from the analysis of the information gathered during the original phase of the All Towns Reconciliation Strategies Study that at least 34 million m$^3$/a of water is lost in the Western Cape municipalities alone (excluding the City of Cape Town and surrounds) between the abstraction at the water resource and the provision to the end-user. Most of this water could be saved through implementing effective WC/WDM measures. These savings would be enough to supply the water requirements of a town like George or Stellenbosch. The situation in the Eastern Cape Province is far worse. There are several examples of towns where 50% and more of the water abstracted does not reach the end-users. In cases without properly measured abstraction and consumption data, acceptable water losses of 15% to 20% have been assumed, but these assumptions most probably grossly underestimate the actual situation. This stresses the need for a good water metering programme, from the water source to the end-users, to better manage water supply and distribution as well as finances in every municipality.

A water balance in accordance with the standard set by the International Water Association (IWA) is prepared for each strategy, where the required data is readily available to enable proper population of the table. The standard IWA water balance has been expanded to include the bulk abstraction and transmission from the source and the treatment process. This will provide a complete overview of water losses and non-revenue water from source to the end-user (see Figure 3) for a specific town.

<table>
<thead>
<tr>
<th>Water resource</th>
<th>Treatment</th>
<th>Reticulation</th>
<th>Consumption</th>
<th>Billed / un-billed</th>
<th>Revenue</th>
</tr>
</thead>
<tbody>
<tr>
<td>Raw water abstracted</td>
<td>Raw water input</td>
<td>System input</td>
<td>Authorised Consumption</td>
<td>Billed metered</td>
<td>Free basic water</td>
</tr>
<tr>
<td>Dam</td>
<td>2,800,000.00</td>
<td>3,441,050.78</td>
<td>3,340,826.00</td>
<td>2,971,159.65</td>
<td>2,964,478.00</td>
</tr>
<tr>
<td>Run-of-river</td>
<td>WTW 1</td>
<td>WTW 1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Groundwater</td>
<td>No treatment</td>
<td>No treatment</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total treated</td>
<td>3,441,050.78</td>
<td>3,340,826.00</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Treated effluent</td>
<td></td>
<td></td>
<td>Reticulation losses</td>
<td>369,666.35</td>
<td>11%</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Seawater</td>
<td></td>
<td></td>
<td>Purchased</td>
<td>369,666.35</td>
<td>11%</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>3,504,574.00</td>
<td></td>
<td>Bulk reticulation losses</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>5%</td>
<td></td>
</tr>
</tbody>
</table>

Figure 3: Extended IWA Water Balance for Hermanus for 2012 (values in m$^3$/a); the bold frame indicates the original IWA Water Balance framework, values in the white cells are calculated from data input.
Evaluation of downstream impacts
The statement “we all live downstream” highlights the need for good management of river systems to ensure that all water resource users (and associated ecosystems) can continue to benefit from their use. Within a catchment, most water resources are connected in some way, and are therefore influenced by each other, with activities in one part of a catchment often impacting on the downstream ecology and water users. To minimise negative impacts and optimise sustainable use of valuable water resources therefore requires an Integrated Water Resources Management (IWRM) approach, which considers the catchment-to-consumer-to-catchment cycle.

TOOLS AND INFORMATION AVAILABLE
The available data and information for monitoring and evaluation of the implementation of the strategies differ significantly between the two provinces, and between individual towns. The implication of the differences is that the monitoring and evaluation process for most reconciliation strategies in the Western Cape runs smoothly, while the difficulties of collating the relevant data persist in the Eastern Cape. Hence, the quality of the output and the detail of the evaluation of the progress with implementation of the strategies' recommendations differ significantly.

Monitoring of water consumption and NRW
The most relevant information required for a meaningful development and update of the water reconciliation strategies is the actual water consumption. Since the focus of the study is on the water resources, the main concern is the raw water abstraction volume, which is usually not monitored. The measuring of volumes needed for a proper water balance are the raw water abstraction, the water treatment works (WTW) input volume, the system input and the billed and unbilled consumption. In the Western Cape, this information is provided by the municipalities on a three-monthly basis to the DWS's Regional Office. For most Eastern Cape municipalities, only some of this information is available (if at all), but is not provided in the same structured format and consistent regularity. The recent introduction of the No Drop System assists in providing better water balance data received from the municipalities.

The water balance data are utilized for several purposes:

- Comparison of actual consumption with available yield to identify shortfalls;
- Comparison of actual consumption with growth scenarios to identify the need for augmentation of the supply and determining when the next augmentation intervention needs to be implemented;
- Developing new water requirement scenarios, based on historic data and proven growth trends and planned development;
- Calculation of non-revenue water and trends thereof; and
- Trends of system input vs billed consumption;
  - opening gap – implementing WC/WDM measures urgently needed; and
  - closing gap – WC/WDM measures successfully being implemented.

Results from RBIG and other studies
The different spheres of government provide a range of funding for municipal infrastructure development and improving service delivery; e.g. the Regional Bulk Infrastructure Grant (RBIG), Municipal Water Infrastructure Grant (MWIG), Municipal Infrastructure Grant (MIG) and the Accelerated Community Infrastructure Programme (ACIP). Funding criteria now also include that the study or intervention must be aligned to the recommendations from the All Towns Reconciliation Strategy for the specific area.

The spatial extent of these grant-funded studies and their results with respect to increased water availability to the end users are evaluated and taken into account in the update of the strategies. Current investigations into potential interventions to be implemented are reviewed and commented on in the light of the most recent, updated reconciliation strategies. If a proposed project is submitted for grant funding and is not aligned to the Reconciliation Strategy recommendations for that area, a full feasibility study needs to be done, comparing all possible water augmentation interventions to the same level of detail.
Regular Performance Assessment by the DWS
Part of the monitoring and evaluation under this study is to track the status and changes in the Blue Drop (drinking water quality) and Green Drop (effluent quality) assessments. These assessment results are indicative of the capacity and challenges within the municipalities, but also the impacts on service delivery and the water resources when standards are not met.

Of great concern are the high number of schemes still with warnings about the drinking water quality and the number of purple drops (<30% for the Green Drop score). Also of concern are the wastewater treatment works (WWTWs) with a decline in their Green Drop Scores, as these could result in water of very poor quality being released into the environment, with dire consequences for the downstream users as well as the river's ecological health.

Another relevant and helpful indicator is each municipality's vulnerability as determined through the Municipal Strategic Self-assessment (MuSSA) project by the DWS. The MuSSA indicates the overall health of the municipality's water business and is a key source of information around municipal performance. 16 key areas of service performance/business attribute vulnerability were identified. From these, the most critical vulnerabilities for the Eastern Cape are wastewater/environmental safety and Green Drop status; revenue collection; technical staff capacity (numbers and skills); water conservation and water demand management; and infrastructure asset management (DWA, 2013b).

CHALLENGES
These strategies are living documents as new information or the implementation of new interventions to augment supplies could change the strategic direction of the recommendations. The biggest challenges for the development and update of the strategies are the availability and accuracy of the information needed. This holds especially true for the vast number of villages in the Eastern Cape, where often the only information is the population served, and even that number might strictly be incorrect due to temporary migration. People often have two homes, one in town where they work and one in the village, which is occupied mainly during weekends or holidays, but both need to be supplied with water.

The implementation of the strategies is often hampered by a lack of acceptance by the municipalities that these strategies are setting the course for the best way forward to ensure sustainable water supplies for future generations. There is also a lack of adequate funding for the implementation of all the recommended and required actions.

RESULTS AND ACHIEVEMENTS
The strategies have already proved to be very helpful for both the Regional Offices of the DWS and the municipalities/Water Service Authorities. E.g. funding applications by municipalities are checked against the strategies and only considered by the DWS, if they are in line with the recommendation in the strategies or they must motivate substantially why the municipality chooses to implement a different intervention. It is also anticipated that the assessment of licence applications for the upgrade of existing schemes or new schemes will be made easier, if the proposed intervention is in line with the recommendations listed in the relevant reconciliation strategy.

All strategies can be found on the DWS website under: https://www6.dwa.gov.za/iwrp/dss/DashboardEngine.aspx?DashboardID=IWRP\Map_Search

Western Cape
The Western Cape accounts for a total of 139 individual strategies for the smaller towns and villages outside the City of Cape Town water supply area. The analysis of the available data for the 2013/2014 municipal financial year indicates that most WSAs are well on track with the implementation of the recommendations in the reconciliation strategies in the Western Cape (DWS, 2014a). Over two dozen towns used significantly more water from July 2013 to June 2014 than predicted, and some others used less. There were also about
three dozen towns with non-revenue water above 30%, topped by Elands Bay with 73% of system input volume not being billed. All of these towns need urgent WC/WDM intervention.

During the updates of the strategies it was recognised that water conservation and water demand management (WC/WDM) remains the most important, cost-beneficial intervention that can be implemented immediately and in a phased manner. Water re-use and re-allocation for equity and efficiency need to be explored, along with the development of alternative sources of groundwater, desalination of brackish and seawater and rainwater harvesting. Groundwater often still remains an underutilised and affordable resource.

Initiatives to reduce water consumption and water losses are underway for Zoar (water-loss study), the whole of Matzikama LM (meters audit and implementing measures to reduce losses), Clanwilliam (pressure reduction), Darling (installing bulk water meters) and Malmesbury (installing or replacing water meters). The Oudtshoorn LM has recently updated its WC/WDM Strategy and awaits Council approval to start with its implementation.

**Eastern Cape**

The Eastern Cape accounts for a total of 130 strategies for the smaller towns and villages. The Eastern Cape strategy area consists mainly of large towns and numerous villages in growth node clusters. In the past decade there has been a major emphasis on addressing the backlogs in water supply infrastructure in the informal suburbs of urban towns and in rural areas. Many rural water supply schemes have been commissioned – both surface and groundwater sourced supplies, throughout the Eastern Cape rural areas.

A major effort to secure and maintain routine monitoring, metering and record keeping of water consumption, including losses, is imperative. This information is not readily available for most of the municipalities and it is an impediment to improving water supply management and planning.
The reconciliation strategies identified the need for water services infrastructure upgrades, mainly related to water treatment and waste water treatment works, as well as storage reservoirs and aging distribution infrastructure for a large number of towns. An overall improvement can be observed, although there are still a number of WSAs that are underperforming (DWS, 2014b).

The high water losses and excessive unit water use are of particular concern and the situation is exacerbated by poor to no monitoring and record keeping. There are several examples where 50% and more of the water abstracted from the resource do not reach end users. The non-revenue water is also high, considering the formal supply area and infrastructure available in most municipalities.

For example, the water balance data received from the Amathole DM, one of the few District Municipalities/Water Service Authorities which have such data collected and available, comprises bulk abstraction, system input and billed consumption. The data clearly indicates the large component of non-revenue water throughout the WSA with some towns recording non-revenue water (NRW) of more than 70% (Willowvale, Ngqamakhwe and Hogsback). There are several possible reasons for these high volumes: Actual water losses in the bulk transmission pipeline, treatment works and/or distribution network; inaccurate bulk water meters; inaccurate or missing zone meters; and/or only partial metering and billing of residential units.

Figure 5: Summary of current water balance situation in the Eastern Cape.

**SITUATION SUMMARY**

Key general findings of the All Towns Reconciliation Strategies for the Southern Planning Region are as follows:

- In the Western Cape, the reconciliation strategies identified the need for water services infrastructure upgrades in a number of towns, mainly related to water treatment and waste water treatment works, as well as additional storage reservoirs;
• The latest Blue Drop and Green Drop scores show an overall improvement. However, there are still a number of WSAs that are underperforming and it is worrying that some of the WSAs with a low overall Blue Drop score could not significantly improve their performances;
• The Local Municipalities needing urgent attention with implementation of interventions (water supply augmentation or additional water services) to reduce their water shortfall are Witzenberg, Beaufort West, Hessequa, Kannaland, Oudtshoorn, Swellendam, Bergrivier, Cederberg, Saldanha Bay and Swartland. In addition, some towns in other municipalities require specific actions to improve their water supply situations;
• All LMs can improve their WC/WDM;
• In the Eastern Cape, the water requirement for domestic use is about 210 million m$^3$/a. However, that volume includes high to very high losses in most towns, as well as towns with a very high per capita use of more than 400 l/day, especially in some coastal holiday towns;
• The data on actual water consumption needs to be improved with implementing good metering and monitoring programmes, as this information is not readily available for most municipalities;
• Areas of extreme vulnerability for the Eastern Cape municipalities are revenue collection, technical staff capacity (numbers) and operation and maintenance of assets; and
• High vulnerability has been noted for staff skill levels (technical), water resource management, drinking water safety and Blue Drop status, wastewater/environmental safety and Green Drop status and infrastructure asset management.

REFERENCES


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