

The World Bank

Operator Round Table  
Study on Impact of Imperfect Data  
Volume 1: Main Analysis

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# Operator Round Table Study on Impact of Imperfect Data Volume 1: Main Analysis

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## **1.0 Executive Summary**

Past Operators Round Table (ORT) work had identified the problem of unavailability of critical good quality data at the bid stage and the impact of this data uncertainty on the future management of long-term contracts for water and sanitation services. There was broad recognition, within the ORT project, on the need for improved approaches to managing these data uncertainties. In situations where data is known to be suspect, consensus had been established on the need for a data revision period in the early years of the contract followed by a robust adjustment mechanism to correct the balance of the contract in the light of the revised data baseline. However, several fundamental issues on how to accommodate new data management approaches into long-term contracts remained unclear, and hence this review was commissioned to explore further some of these key questions, among which were:

- What data should populate the data room at the bid stage?
- How should the revision period be designed?
- How should the adjustment mechanism be designed?

The study comprised a review of literature, contract and bid documents, supported by data analysis and focused discussions with operators. This report discusses these broad questions and makes a series of recommendations on how to better manage such data uncertainties in the future.

### **Key Findings**

Long-term forecasting of service targets in most developing countries is a high-risk strategy, as many of the critical data sets needed to establish the targets are commonly at highest risk of error. To allow this forecasting, as well as the formulation of an adequate offer by bidders, certain key data sets must be available at the bid stage and the following short-listing of important data categories is critical to the bidding of long-term contracts. These data sets should be collected for the data room:

1. Revenue and costs
2. Basic production priorities
3. Current service standards: water and service quality
4. Customer base
5. Resource quality and quantity
6. Infrastructure assets

Within this report, a series of recommendations are put forward for improvement of monitoring and collection of these data sets, among which are:

- Establishment of pre-transaction capacity building and monitoring programme
- Installation of 'robust' bulk meters at key monitoring points

- ❑ Establishment of operational monitoring systems as early as possible during the transaction stage.

However, despite these measures, the following specific data sets (Table 1 below) are likely to have some significant uncertainties at bid stage, and are fundamental to establish the scope of service targets, investments and ultimately the tariff package. Hence the Transaction Advisor and the utility should focus activity on collecting a ‘best available’ data set for these items at bid stage, but with the acknowledgement that the data can only be illustrative and will require the operator to collect and refine the data post contract award, and ahead of some form of formal contract revision.

<b>Table 1 – Critical High Risk Data Sets</b>		
Unaccounted for Water – physical and commercial losses	No of consumer connections Database of current users Population figures	Scope of investments required – especially detailed investment plans for below ground assets
Condition and performance of assets – especially below ground	Consumption patterns/ water demand, metering rate	Level of service and service targets
Water resources safe yield and seasonal reliability	Groundwater resources assessment	Service coverage and coverage targets

### **Key Recommendations**

Despite potential improvement of data monitoring and collection at the transaction stage, in many cases in the developing environment, data uncertainties will not allow the setting of appropriate and robust long-term targets at the transaction stage.

We therefore recommend that the operator refines the data baseline during the first years of the contract, which would be designed as a transition period during which the operator will be contractually obligated to monitor and gather robust information on the utility system. In conjunction with the refinement of the baseline data, we recommend the implementation of a robust rules-based periodic adjustment process with an Independent Expert employed to guide the process of agreement finalisation.

Our main recommendations and guidelines for the transaction period, for the design of the transition period, as well as for the structure of the adjustment process, are presented in the following tables.

In Table 2 below is a summary of issues and recommendations, on which general consensus and understanding exists within the sector<sup>1</sup>.

**Table 2 – Issues and Recommendations with General Consensus**

Issues	Recommendations
Lack of accurate data at the bid stage	<ul style="list-style-type: none"> <li>- Bid against best available data, a limited set centred on the key utility operations</li> <li>- Need for data gathering and review at the end of a 'transition' period, and for adjustment mechanisms during the contract</li> </ul>
Need for improvement of data monitoring and gathering at the transaction stage	<ul style="list-style-type: none"> <li>- Implement short Initial Data Review to assess the extent and veracity of available data</li> <li>- Establish appropriate monitoring systems up-front at the transaction stage</li> <li>- Issue 'best practice' guidance on data monitoring and gathering at the transaction stage</li> <li>- Improve phasing of TA activities to limit time period between data gathering and bidding, or else</li> <li>- Provide second refined data package at negotiation stage, if transaction period is prolonged</li> </ul>
Need for a well-designed 'transition' period in early years of contract	<ul style="list-style-type: none"> <li>- Input based targets specified in physical terms in lieu of performance targets</li> <li>- Data gathering as part of the operator's contractual obligations</li> </ul>
Need for a data review at the end of the transition period	<ul style="list-style-type: none"> <li>- Process and methods for review must be more clearly detailed in contract</li> <li>- Independent Expert to manage the process or at least audit it</li> </ul>
Need for adjustments and/or compensation mechanisms at the data review	<ul style="list-style-type: none"> <li>- Adequate timeframe for data review and adjustment between 2 and 5 years – depending on initial status of utility</li> <li>- Consider other adjustments than tariff adjustment such as scope and phasing of investment plan and service targets</li> <li>- Develop a rules based adjustment mechanism linking tariff, investment plan and service targets to be incorporated into the contract clauses</li> <li>- Independent Expert to audit the compensation process and adjudicate in the event of disagreements over final negotiation – with limited discretionary powers for determining the compromise solution</li> <li>- Arbitrator to adjudicate in the event of disputes</li> </ul>
Need for appropriate performance monitoring indicators during the first period of the contract	<ul style="list-style-type: none"> <li>- Limited number of well-chosen surrogate indicators, based on 'easy-to-measure' data sets (issues also explored by ORT sub-group #5<sup>2</sup>)</li> <li>- Set incremental service targets – avoiding suspect data sets</li> <li>- Aggregate scoring system could be used to give an overall picture of the performance</li> <li>- Penalty mechanism in early year to be linked to the scoring system or input based targets</li> </ul>

<sup>1</sup> Based on our understanding of discussions with various stakeholders.

<sup>2</sup> See Cook, Peter D. and Stevens, Jonathan, *Consumer-Oriented Reporting of Service Performance*, Second Interim Report, June 2004, Draft Final Report, August 2004 and Final Report, November 2004

In Table 3 below are summarised those issues and recommendations on which consensus within the sector is not yet established and for which further exploration and review will be required:

**Table 3 – Issues and Proposals without General Consensus**

Issues	Proposal	Pros & Cons
Pre-TA data monitoring programme	Improve capacity building / issue best practice guidelines for pre-TA monitoring programme for the municipality	<ul style="list-style-type: none"> <li>- Monitoring programme established well in advance would allow for better quality of data at the bid stage</li> <li>- Problem for funding of pre-TA programme?</li> <li>- Stakeholders not willing to prolong the reform process further</li> </ul>
Use of data risk assessment techniques to determine best PPP contract options at TA stage	Use of consequence and likelihood of error matrices to categorise likely data impact on forecast contract parameters – service targets, investments, revenue	<ul style="list-style-type: none"> <li>- Guides TA / municipality in understanding the data risk inherent in the baseline</li> <li>- Could guide TA toward different contract strategies</li> <li>- Relies on subjective judgement, i.e. it is not an exact science</li> </ul>
Design of adjustment/compensation process	<ul style="list-style-type: none"> <li>- Tariff adjustment formula to be combined with good practice rules based procedure to establish new balance of service targets, investments and tariff</li> <li>- Five-step approach linking level of service, investment and tariff review (linked to tariff review formula proposed by ORT sub-group #1)</li> </ul>	<ul style="list-style-type: none"> <li>- Provides a clearly understood and auditable relationship between tariff, investments and service</li> <li>- Implementing a rules-based 'route map' limits the opportunities for disagreement</li> <li>- Mathematical formula cannot be used in practice – too complex</li> <li>- There is still a need for a final agreement / negotiation between parties albeit with a narrow and well-defined structured process of discussion</li> </ul>
New contracting model: setting performance targets after a transition period	Define appropriate targets and contractual commitments only at the end of a transition period when good quality data sets are available	<ul style="list-style-type: none"> <li>- Avoids the usual problem of inadequate targets set at the beginning of the contract when good quality data are not available</li> <li>- How to commit the operator at the bid stage to longer term commitment?</li> <li>- How to prevent 'low-balling'? (issues explored by ORT sub-group #3<sup>3</sup>)</li> </ul>

<sup>3</sup> See Shugart, Chris, *Procedures for the Selection of the Concessionaire*, Draft Final Report, August 2004

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## **Explanation of Terms Used**

- Co-contractors:** This term refers to the parties contracting for the operation and delivery of water and sanitation services, often being a municipality and a private operator.
- Transaction Period:** This period starts with the decision to implement a reform of the water sector through private sector participation and ends with the award of the contract. This period usually comprises the following steps:
- Policy framework and reform dialogue
  - Data collection
  - Public-Private Partnership framework design
  - Preparation of bid process
  - Bidding process
- Transition Period:** This term refers to the period occurring at the beginning of the contract, during which a transitory regime is in place where new operational regimes and monitoring systems are established.
- Revision Period:** This term refers to a defined period in the early years of the contract, during which particular effort is applied to monitor and gather accurate information on the utility operation. The revision period ends with contractual or regulatory review of performance over the defined period.
- True-up:** This term refers to the process of reviewing the data baseline at the end of a 'revision period'. It appears that there are some inconsistencies in the use of this term within the sector. To avoid any misunderstanding, the term is not used in this study.

**Data Review:** This term refers to the process of auditing and agreeing on new values for data baseline, and occurs at the end of a defined period of the contract, during which a monitoring programme has gathered accurate baseline data.

**Price Review:** This refers to the process of adjusting the tariff when fundamental changes have occurred and affect the balance of the economic equilibrium of the contractual service.

**Adjustment:** The sector uses this term in particular with reference to tariff adjustment. However, for the purpose of this study, adjustment refers to the process of reviewing and resetting the service target parameters in order to keep the economic equilibrium of the contracted service. The parameters that can be adjusted are:

- Tariff
- Service and performance targets
- Scope and amount of investments
- Timeframes (of the contract service targets or of the transition period for example)

**Independent Expert:** The term of Independent Expert is used generically in this report to identify a specialist independent advisor, the remit of this expert being agreed and determined by the Municipality and Transaction Advisor pre contract, or by the co-contractors post contract award. Depending on the purpose for which the Independent Expert is required, and on the choice made by the appointing parties, the Independent Expert can be a panel of experts, the Transaction Advisor, the regulatory authority or a specialist individual, consultant or firm of renowned standing in the field of specialism in question.

## 2.0 Introduction

To understand better and meet the difficulties encountered by operators in concession contracts and their current reluctance to bid for long-term contracts, the World Bank has established the Operator Round Table (ORT) study in order to develop new options for long-term water and sanitation services contracts in developing countries. This consultant has been appointed to assess risks related to unavailability of accurate data at the bid stage, and the impact that this imperfect data can have on the management of the procurement process.

The objectives for the study are summarised briefly below along with the steps taken to explore the key questions raised in the Terms of Reference (reproduced in Volume 2, Annex 9 of this report).

**Table 4 - Project Route Map**

Objective (from TOR)	Approach	Report Section
<b>Identify relative importance of data items to bid process</b>		
Establish long list of data items	Review of literature, contract documents & interview of operators	3.0 & Annex 1
Identify categories of data and mapping of their impact	Analysis of data sets assigning characteristics and defining interrelationships	3.0 & Annexes 2 & 3
Rank data according to importance	Assess risk by assigning likelihood and consequence gradings – rank according to significance of risk + validation by focus group discussion with peer review operator	5.0 & 6.0 & Annex 5
<b>Identify high priority data</b>		
Identify the highest priority data for the bid	Assess risk by assigning likelihood and consequence gradings – rank according to significance of risk + validation by focus group discussion with peer review operator	6.0 & 7.0 & Annex 5
Identify who can best provide high risk data at bid stage	Review of sector best practice and recommendations for improvement	7.0
Identify high priority data that is not available at bid stage and the impact this has on the procurement route	Assessment of ability to forecast service targets and outline decision tree for procurement options	7.0
<b>Develop mitigation options and potential contract clauses</b>		
Consider risk mitigation options and recommendations for managing high risk data – including options for baseline revisions, progressive indicators and rules based adjustment	Review of literature and contract documents, operators' feedback on potential options	Annex 6
Develop recommendations for risk mitigation options	<ul style="list-style-type: none"> <li>– Proposals for better data management at TA stage</li> <li>– Suggestions for contractual adjustment mechanisms, target setting and early year targets</li> </ul>	10.0
Prepare draft bid and contract clauses	Guidelines for outline risk mitigation clauses	11.0 & Annex 8

This study focuses predominantly upon long-term water services/contracts although the findings and recommendations are equally applicable to long-term sanitation services/contracts.

## **3.0 Definition and Categorisation of Targeted Data**

To begin the analysis of the impact of imperfect data sets it is first necessary to:

- Define what we understand by 'data' in this context
- Categorise the data sets and to identify data sets within the influence and control of the co-contractors
- Understand the characteristics and interrelationships between data sets – to better understand the risks

### **3.1 Definition**

In ascribing data sets under any form of categorisation it is necessary to examine our definition of what constitutes a data set and what constitutes imperfect data.

The starting point for this study has been to develop a 'long list' of all the data sets that may have some impact, influence or relevance to the provision of water services and utility operation. This 'long list' is included in Annex 1.

Most of the items included in the 'long list' correspond to the meaning one usually gives to the word "data", i.e. they correspond to quantitative/numerical measures, and do not entail particular conceptual difficulty with regard to their definitions: e.g. households' incomes, pipe network mapping, population served, GDP per capita...

Some other data sets are not so easy to define and include:

- Political and cultural framework (level of social pressure/ political requirements for improved service, level of corruption) - all highly subjective topics;
- Legal and regulatory framework (regulatory mechanisms, mechanism for co-ordination with conceding authority). The issue here is not whether these frameworks exist rather the critical question is probably the quality of the existing laws/mechanisms and the rigour of their enforcement rather than the availability of relevant information at the bid stage;
- Forecast data sets that are the results of subjective estimations, including engineering judgement, forecasts and choices (such as perimeter of the concession, or service targets). Conventional contract models require performance targets to be forecast and fixed at the bid stage, even where data is questionable – this forces the Transaction Advisor team to determine a 'best estimate'.

For completeness of overview, we chose to focus the study on the impact of the information that should be gathered for the bid, whether it corresponds to a strict definition of the term “data” or not. For this study, this leads to a simple definition of the data we are interested in assessing:

'All quantifiable and qualitative facts that should be gathered at the bid stage and which have a significant impact on the operational efficiency and on the financial balance of the contractual service'.

The first premise here is that if the concession operation is executed in an efficient manner, and if the service is financially sustainable, then reasonable targets (social, political and contractual) can be achieved.

The second premise is that concessions are partnerships played out within the framework of the contract – hence expectations must be managed and achieved for both the conceding authority and the operator.

For the purpose of the study, an imperfect set of data is defined as unreliable information characterised by data that:

- are incomplete
- are inaccurate
- are unstable in time and need to be assessed periodically
- are difficult to measure, or
- are otherwise unreliable due to one or more of the following factors:
  - They are based on old studies and badly maintained records;
  - They are based on studies or surveys that would require a minimum technical or institutional capacity that appear to be questionable or lacking;
  - They are based on estimation methods that are likely to increase their degree of approximation and the inherit error in the base data.

This sets the context for the forthcoming evaluation.

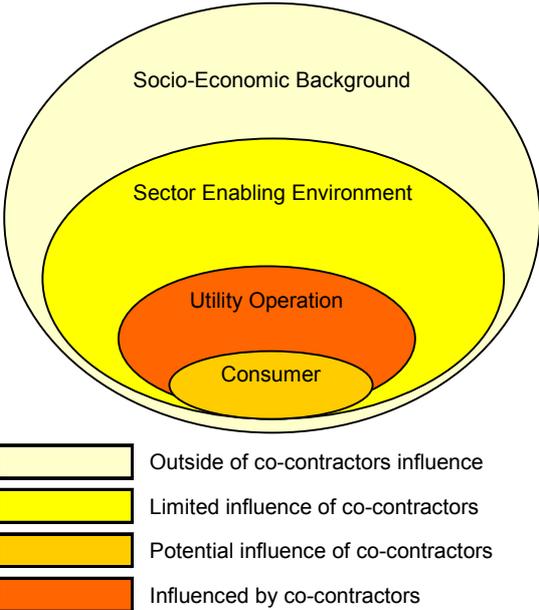
**3.2 Categorisation of data**

The data can be broadly categorised on the basis of their increasing relevance to the service provided to the consumer, as illustrated in the Diagram 1 and Table 5 below and more fully in Annex 1 (refer to Volume 2):

**Table 5 – Data Categories**

Primary Data Category	Sub-Categories
Socio-Economic Background	<ul style="list-style-type: none"> <li>- Demographic</li> <li>- Macroeconomic/ development level</li> <li>- Social</li> <li>- Geographic/ environmental</li> <li>- Political and cultural</li> </ul>
Sector Enabling Environment	<ul style="list-style-type: none"> <li>- Economic</li> <li>- Legal/ regulation of sector</li> </ul>
Utility Operation	<ul style="list-style-type: none"> <li>- Revenue</li> <li>- Physical/ Infrastructures and assets</li> <li>- Customer base</li> <li>- Production parameters</li> <li>- Service parameters</li> <li>- Regulation of contract</li> </ul>

**Diagram 1  
Influence of co-contractors on data categories**



The socio-economic and enabling environment are largely outside of the influence of the co-contractors, but are acknowledged here for completeness. They are not considered further in this report, although their importance to the success of long-term contracts should not be understated. The foregoing discussion centres on data sets for utility operation and the consumer.

A further point to note on categorisation is that there is more than one set of critical baseline data, with differing relevance to different stakeholders, at different stages in the process and potentially assessed through different treatment processes. The following summaries the differing data needs of the parties to a typical concession:

- ❑ Bidders: a set of critical data, centred on operation, that should be reliable enough at bid stage, in order to allow bidders to build an efficient and realistic offer;
- ❑ Conceding Authority: a set of critical data, that should be reliable enough prior to bid stage in order to set clear and reasonably ambitious contractual targets, and which reflect the wider political and social objectives of the reform;
- ❑ Operator: a third larger set of critical data to aid management choices and operations strategies.
- ❑ Regulator/co-contractors: a set of critical data against which the operator's performance will be monitored and penalised/rewarded – the contract monitoring data.

### **3.3 Mapping**

To help build a comprehensive understanding of the many data sets that impact on a contract, and to better understand the characteristics of the different kinds of data, the 'long list' items have been classified according to the criteria listed in Table 6 overleaf (also presented in a series of tables in Annex 2). An accompanying mapping shows the interactions between the 'long list' data items and a services contract for utility operation (see Annex 3).

**Table 6 – Data Classification and Characterisation**

Classifier	Features
Data Type	<ul style="list-style-type: none"> <li>- Numeric data</li> <li>- Factual data</li> <li>- Qualitative data</li> </ul>
Data Source	<p><b>Base Data</b></p> <ul style="list-style-type: none"> <li>- Census/ national office of statistics/ national studies/ field studies</li> <li>- Records of the previous provider/ municipality</li> </ul> <p><b>Derived Data</b></p> <ul style="list-style-type: none"> <li>- Data that result from the treatment of base data and/or calculations: e.g. demand, population served. This also includes most contractual performance targets.</li> </ul>
Characteristics	<ul style="list-style-type: none"> <li>- The difficulty to obtain the considered data;</li> <li>- The availability of data;</li> <li>- The accuracy of data;</li> <li>- The impacts of inaccurate data on the bid and the contract; and</li> <li>- The importance/criticality of the data at the bid stage/for the contract.</li> </ul>

Some observations from the literature review and data characterisation can be drawn:

- **Complexity:** The mapping shows a complex whole where base data sets have a high degree of interconnectivity with second level/derived data, influencing in different ways, and often through more than one interaction route, the utility operation.
  
- **Consistency:** Derived data sets can be developed from different sources and applied techniques and be estimated or calculated by different analytical methods, all leading to sensibly different results. The number of population served is a good example: it can be estimated by counting houses in the service area, from water consumption, from the number of connections, from a customer satisfaction survey or by interpretation of historical census data.
  
- **Accuracy:** The level of accuracy may vary largely depending upon the method of data collection/estimation chosen. Furthermore, the accuracy level often is not, and in many circumstances cannot be, certified or validated without extensive additional study, which is usually a luxury not available to the Transaction Advisor at bid stage – hence many data uncertainties remain unqualified and pass forward at the operator’s risk.
  
- **Completeness:** There are no 100% accurate data sets within the mapping, except perhaps data on legal texts, and even then it should be noted that the actual practice may differ from legislation if application, enforcement or regulation are weak.

- **Context:** Depending on the context within which the data set impacts on the procedural mechanisms within the contract, the unavailability of critical data may not impact as much as might be expected on the service parameters. The concession contract in Gabon is perhaps a good example: this contract is considered as a 'successful contract'<sup>4</sup>, although the assets inventory (a fundamental data set in most views) wasn't completed at the bid stage, nor at the end of the transition period. The contract structure is such that the lack of this data set, within the framework of the contract, has not penalised either party or prevented the primary social target (coverage) being achieved and exceeded. It must be noted also that Gabon is a multi-utility concession (water and electricity), which allows a high level of cross-subsidisation.

**Finding:**

There are usually no 100% accurate data sets at the bid stage.

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<sup>4</sup> Emerging Lessons in Private Provision of Infrastructure services in Rural Areas: *Water and Electricity Services in Gabon*, Sophie Tremolet and Joanna Neale, The World Bank/ PPIAF, September 2002, ref. 8524

## 4.0 Process and Initial Data Review

The data treatment process has been mapped and illustrates how under a typical bid the same base data can lead to different interpretation or to some opinion/expectations divergence between the conceding authority and the bidder/operator (see diagram 2 overleaf).

Of particular note is that the choice and definition of service targets can be biased at two stages:

- Subjectivity in forecasting: the use of poor/inaccurate base data sets for the basis of the calculation and evaluation of targets – here the extrapolation and projection of uncertain data sets requires a high degree of interpretation and subjective judgement.
- External bias: the treatment of base data can be influenced by political, financial and cultural considerations –historical utility performance data being particularly susceptible to biased reporting (e.g. unaccounted for water).

These risks, which do not relate so much to the accuracy of the base data, but rather to the treatment of the data during the forecasting process, can be relevant for the setting of service standards targets or the calculation of the level of investments required. For example coverage targets and definition of the service perimeter are usually fixed prior to the bid and are therefore treated by the conceding authority as the performance baseline data that sets the contractual risk balance. As the operator may not normally have any control or take part in the decisions leading to these targets and baseline parameters being set at bid preparation stage, the operator must judge during due diligence if the targets are realistic and achievable. The uncertainty inherent in the forecast service targets have historically been largely transferred to the operator under past procurement models.

It is apparent that service targets forecasts resulting from choices or treatment of base data (usually established by the Transaction Advisor in association with the Municipality and the water utility) are not always free from political and cultural influences. Therefore the data treatment process itself may be of equal importance in influencing the impact of imperfect data sets, as may be caused by the inherent errors in the data itself, and so better cognisance of the economic, political and cultural data influences could help understanding of the thought processes employed in setting the bid and contract targets. To do so may help the conceding authority and the bidders to understand better the introduced risks and 'optimism bias' that are inherent in the treatment of targets, and so aid common understanding of the result of this treatment when negotiating the contract.

From this overview, it is recommended that an early review of such factors by the Transaction Advisor would help in assessing the inherent data risk (whether quantified base data error or an introduced bias) resulting from unavailability or poor quality of data at the pre-bid target setting stage. The review would inform the Transaction Advisor on the likely data management issues within the procurement process and would comprise a rapid assessment over a period

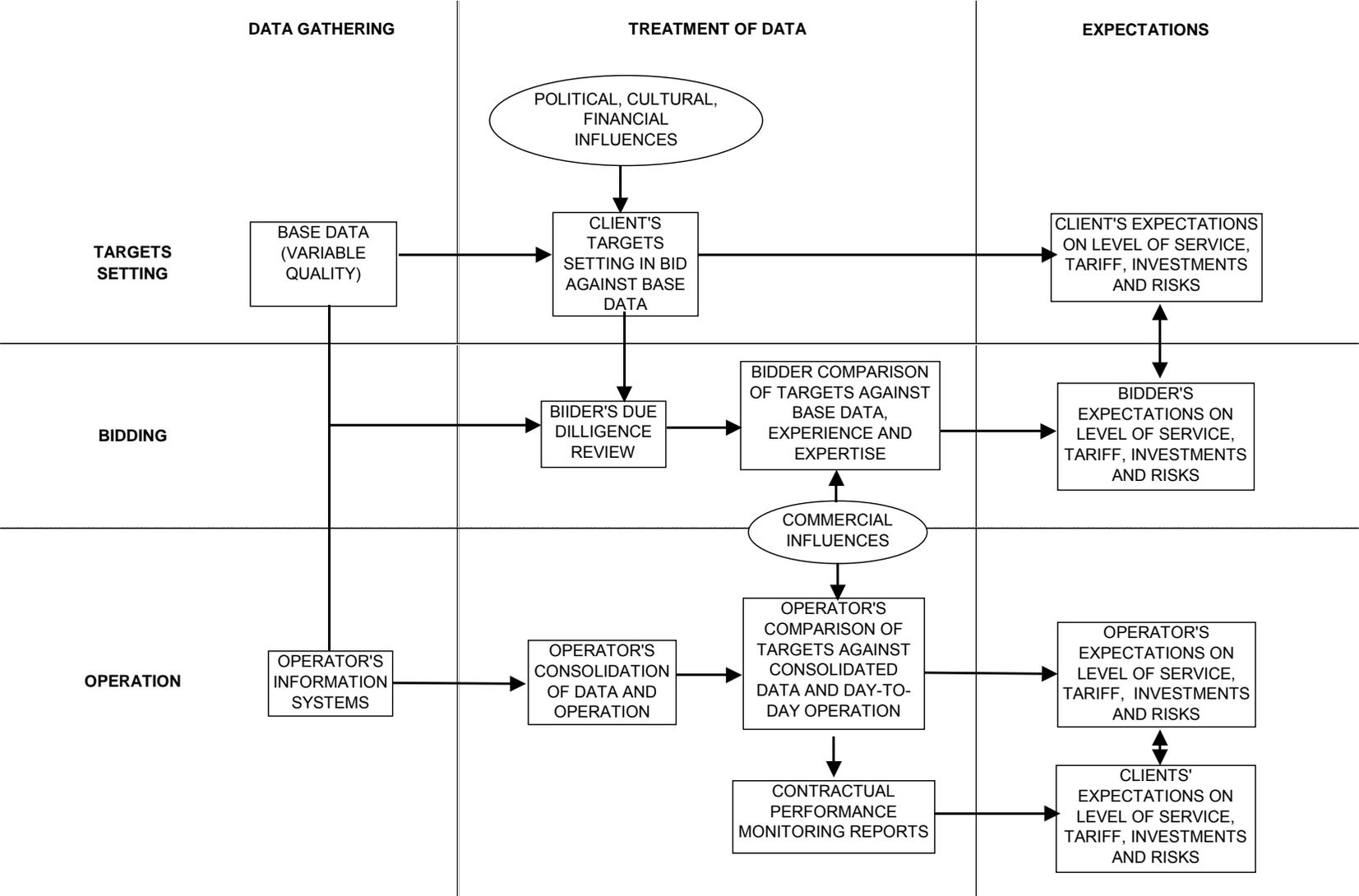
of, say, two to four weeks to identify the extent and veracity of available data. There are several potential benefits from such an early review – termed here the Initial Data Review:

- An Initial Data Review could help the operators to assess the level of data risk they take and accept at the bidding stage - this may potentially focus their due diligence activity and also inform their sensitivity modelling and risk analysis.
- An Initial Data Review could help the conceding authority to understand the long-term implications of their own decisions on targets (including optimism bias).
- An initial Data Review may enable the Transaction Advisor to target their efforts toward compiling more useful and more complete data prior to the bid stage and prior to the calculation/choice of service targets.
- An Initial Data Review may inform the Transaction Advisors' understanding of the need for long term 'data review' or adjustment mechanisms to reflect the changing realities of a long-term contracted operation, and may even assist in the determination of the contract form and bidding strategy to be employed.

**Recommendation:**

An Initial Data Review could be incorporated into good practice guidelines for the Transaction Advisor to inform understanding, aid planning and focus activity, and highlight risk management issues for all parties.

Diagram 2 - Process of Data Treatment at Bid Stage



## **5.0 Establishing Priority Data Sets**

For the purpose of this study, a data risk assessment methodology has been developed in order to illustrate the potential risks inherent in the use of poor data. The aim of this approach is to assess the generic risk for the bid and for the contract by imperfect data use at the bid stage.

Each element in the 'long list' has been assessed in terms of the likelihood of inherent inaccuracies and the associated impact on contract implementation. The risk is derived from the degree of uncertainty associated with each data item and is assessed by a combination of two sets of assessments:

- The assessment of the likelihood of error within a specified magnitude band being inherent within the data. For some categories of time bound data, this likelihood of error is assessed over 5 years, as indicated in the Table 7 overleaf.
- The assessment of the consequences of this imperfect data on key parameters of the service/contract, as indicated by Table 8. The analysis compares each data item against the four critical factors that influence the success and sustainability of a long-term contract form, which for this study are defined as:

**1). Level of Service**

**2). Operating Costs**

**3). Investments**

**4). Revenue Stream**

This approach is by its nature subjective and is presented here in terms of assumed impact on a generic long-term contract to give a 'typical' data scenario in a developing country. The assessment draws on the authors' specific knowledge of past work in data poor African water utilities. As such the results are illustrative, and indeed cannot be definitive, as each utility and locality would be influenced by its own operational status, water and sanitation system characteristics, state of preparedness and quality of data management systems and records.

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**Table 7 - Likelihood of Error - Guidance**

<b>Likelihood Rating</b>	<b>Error Magnitude</b>	<b>Guidance</b>
<b>1</b> Very Low (VL)	0 to 10%	<ul style="list-style-type: none"> <li>• Accurate studies or historical records are usually available;</li> <li>• These data are stable in time;</li> <li>• These data are easy to predict, measure and check;</li> <li>• A field visit gives a sufficient idea of the reality; - i.e. it can be 'sense checked' by qualitative means.</li> </ul>
<b>2</b> Low (L)	10 to 20%	<ul style="list-style-type: none"> <li>• Studies are usually available on the subject, but the data are not always 100% accurate as they are based on calculations from other base data and rely to a degree on the capacity and performance of national statistics agencies; or like third party agencies where quality control may be an issue;</li> <li>• These data are usually stable in time and easily predictable, but some exceptional events may occur; which distort trends;</li> <li>• The collection of these data are based on large scale field studies / surveys;</li> <li>• The data rely on observation of facts but may involve some personal judgment;</li> <li>• Historical records may not always adequately reflect the actual practice, with some known inconsistencies or data gaps.</li> </ul>
<b>3</b> Moderate (M)	20 to 30%	<ul style="list-style-type: none"> <li>• These data are difficult to assess over time;</li> <li>• These data are based on methods of estimation/are difficult to measure or assess, and require rigorous quality control which may be lacking;</li> <li>• The collection of these data requires a large scale study, but often is based on extrapolation of results from a pilot study;</li> <li>• The collection of these data requires some particular technology and entails significant expense, and so may instead be estimated by benchmarking or reference to international knowledge / assumed best practice;</li> <li>• Some historical records / facts give an idea of the reality, but involve a high degree of personal judgment in interpretation.</li> </ul>
<b>4</b> Significant (S)	30 to 50%	<ul style="list-style-type: none"> <li>• These data are very difficult to assess, especially over time;</li> <li>• Available studies on the subject are known to be inaccurate, and significant doubt exists as to the quality control of the collecting body;</li> <li>• The data rely on estimations based on base data with known accuracy risks.</li> </ul>
<b>5</b> Very Significant (VS)	over 50%	<ul style="list-style-type: none"> <li>• Studies are usually not available on the subject;</li> <li>• The data is unstable and not predictable even in the short term;</li> <li>• These data rely on estimations based on very uncertain base data or unproven benchmarks.</li> </ul>

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**Table 8 – Consequence Matrix - Impact on the Service/Contract – Guidance**

Rating	Impact on investments	Impact on OPEX	Impact on service/operation efficiency	Impact on revenue/tariffs
<b>1</b> No Impact (NI)	No Impact	No Impact	No Impact	No Impact
<b>2</b> Low (L)	Investments required are from 0 to 5% lower / higher than expected	Operating costs are from 0 to 5% lower / higher than expected	- Service performance is close to targets - Operation is efficient, except for some occasional incidents/delays	- Revenue is close to expectation but may have occasional fluctuations requiring regulatory adjustment of tariff structure and rates within social and financial limits under the normal contract adjustment procedures
<b>3</b> Moderate (M)	Investments required are from 5 to 10% lower / higher than expected	Operating costs are from 5 to 10% lower / higher than expected	- Service performance does not meet, or exceeds, targets by a clear margin - Day to day operational efficiency is affected from time to time by delays and lack of co-ordination	- Revenue is from 5 to 10% lower / higher than expected - Tariff rate/structures do not allow sufficient levels of cost recovery/ROI to meet original expectations
<b>4</b> Severe (S)	- Investments required are from 10 to 20% lower / higher than expected - Investment scope and priority has to be seriously reconsidered	- Operating costs are from 10 to 20% lower / higher than expected - Cost allocation should be reconsidered and operational practices changed	- Service performance are far from meeting targets: e.g. low pressure, poor water quality, intermittence - Targets should be seriously reconsidered - Delay issues affect day-to-day operation	- Revenue losses affect sustainability of the service or lead to 'super profits' - Tariff structure and rate should be seriously reconsidered – ROI requires that the tariff approaches the limit of social or political acceptability
<b>5</b> Very Severe (VS)	- Investments required are over 20% lower / higher than expected - Investment scope is inadequate	- Operating costs are over 20% lower / higher than expected - Cost allocation is inadequate and drastic procedural change is enforced leading to service failures	- Service performance cannot meet targets: low pressure, significant unreliability, poor water quality - Service targets are unrealistic - Long delays affect operation and service	- Significant financial losses - Tariff structure and rate are completely inadequate - Service is not sustainable

Using this treatment, a short list of items that are particularly at risk from imperfect data and which are critical to the sustainability of the contract are listed below (the first pass analysis results are detailed in Annex 5):

**Greatest Uncertainty Data Sets**

- **Data related to revenue and costs:** revenue collection performance, scope of investments required, billing ratio, price of bulk water;
- **Condition of assets:** metering rate, unaccounted for water, condition and performance of assets, distribution network mapping, inventory of meters;
- **Customer base:** number of households served, service coverage ratio and consumption patterns;
- **Data on water resources:** availability and quality of ground water resources;
- **Targets:** Water quality and service targets<sup>5</sup>;
- **Procedures for investment adjustment:** coordination with conceding/regulatory authority concerning decisions on investment planning (risk of deferring the timely implementation of key funded investments);
- **Political and economic background:** political stability, inflation and exchange rate.

The outcome highlights that many of these critical list items are commonly used to forecast and measure contractual performance where the data at bid stage is often of poor quality.

Issues of the treatment of the bid stage data, and particularly the forecasting of future performance, become as critical as the fact that the data set may be poor at the outset. Indeed, it is conceivable that you may start with reasonable base data but forecast it poorly. This confirms that availability of accurate data is important at the bid stage, but also that the treatment of data is critical for the clients and their advisers when they come to define service targets and related investments for the contract (level and phasing of targets, flexibility, adjustments during the contract).

To illustrate the implication of poor data sets on forecasts of future performance, the Diagram 3 overleaf uses the generic calculation for revenue collected to highlight the many potential sources of error and hence the difficulty in forecasting from a suspect baseline data set.

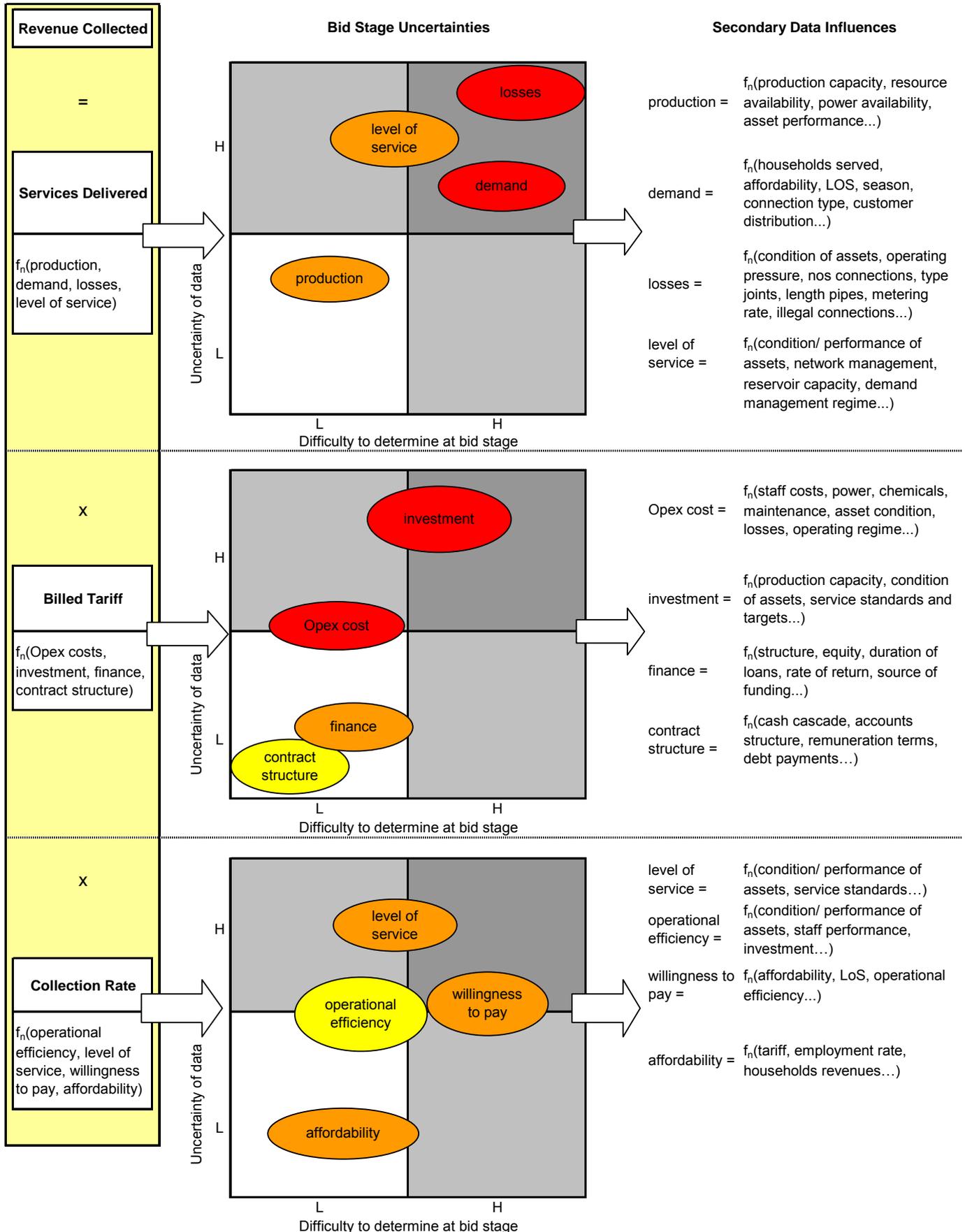
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<sup>5</sup> The question applied to targets in this analysis is the risk entailed by the Transaction Advisors / conceding authority setting of inadequate / unrealistic targets, rather than the availability of accurate baseline data used to set the targets as these baseline data items are assessed independently within the 'long list'.

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Diagram 3 - Illustration of Generic Interrelationships between High Uncertainty Data on Revenue Forecasts at the Bid Stage



## 6.0 Operators' Feedback

Focus group discussions were held with the nominated ORT peer review operator, Suez Environment, in April and July 2004. These discussions confirmed that not only is baseline data availability at the bid stage a major issue, but also that the poor baseline data issues continue to perpetuate contractual issues during the operation phase. This was illustrated with some case studies, which showed the difficulties entailed by the inaccuracy of baseline data at bid stage and often encountered by operators (Buenos Aires, Manila, Puerto Rico).

The following challenges appear as crucial:

### Baseline Data

- ❑ There is usually considerable baseline data uncertainty at bid stage, and it is doubtful that this can be cost-effectively remedied prior to bidding in the developing environment.
- ❑ Important baseline data that operators wish to obtain at bid stage should be centred on basic information on operation and revenue generation.

### Setting Contract Targets and Objectives

- ❑ Targets should be set based on reasonably ambitious objectives and principles, to be achieved at manageable horizons, which should be clear enough to avoid any interpretation conflicts. These contractual objectives should be aligned with the political objectives for sector reform.
- ❑ The bid process, where possible, may benefit from the inclusion of a peer review challenge process, whereby the contractual objectives set by the Transaction Advisor during bid preparation are subject to challenge by an independent peer review team, knowledgeable in concession operations. This process being akin to the type of internal peer review that operators may themselves undertake at due diligence.

### Revision Period

- ❑ Sufficient time is crucial: it usually takes operators a few years to gather reliable sets of information on service parameters before real confidence in operational data is attained, which can be up to 5 years for some items like unaccounted for water where the initial baseline is very poor, but for most other parameters should be achievable within 2 to 3 years.

### Recommendation:

The conceding authority should set clear and reasonably ambitious objectives to be achieved at manageable horizons. To this aim, it is essential to gather a minimum set of good quality data at the design and bid stages that is reflective of these objectives.

**Critical Data for Bidders**

In any long-term or performance-based contract, bidders need reliable baseline data against which they can propose an efficient and realistic offer. These critical data, which comprise the core components of the data room, should be centred on basic information on operation, as follows (see list 'bid' in Annex 1ter.):

**Recommendation: Data Room**

1. Basic economic data: revenue and costs
2. Basic production parameters
3. Current service standards: water and service quality
4. Customer base
5. Resource quality and quantity/ environment
6. Key elements on infrastructure, such as number of kilometres of pipes.

Hence, focusing on this limited set of key information prior to bid stage (less data, but better quality data) is recommended as a way to partially mitigate the usual unavailability of accurate data.

**Recommendation :**

The conceding authority should focus on a limited number of key data sets for the data room centred on operation – perhaps less data, but of better quality.

## 7.0 Managing Critical Data Collection at Bid Stage

Having established the list of critical data, it is useful to explore which of these items should and could be gathered at bid stage in a cost effective and a timely manner, what methodologies could be employed to improve the quality of these data sets at the bid stage, and who should best undertake the exercise of data collection. To this aim, some general considerations should be kept in mind:

- Operators are usually more widely experienced than the conceding authority, and are better equipped to assess and gather data sets relating to operation and service parameters, level of service, below ground infrastructures, and in some cases water resources management – as a consequence, any non essential operational data gathering could therefore usefully and more cost effectively be deferred to the contract period.
- It is accepted that gathering reliable data takes time, money and a rigorous approach. It is therefore unrealistic to ask municipalities, who are usually constrained by available funding, to spend a couple of years assessing and gathering data that ultimately may not be acceptable to the bidders. However, there remains a need to guide municipalities toward better data collection activities that are cost-effective, timely and auditable.
- Some data are politically and/or socially sensitive and could be biased if treated by clients under political or social pressures. They therefore need an independent benchmark or assessment.

These general considerations should be further developed for the following items:

### **Basic financial data on costs and revenue:**

- ❑ Basic financial data are the most important data that operators wish to establish prior to bid stage.
- ❑ Yet, an accurate assessment of these data sets linked to revenue can sometimes be difficult as it requires reliable information on the consumer base, commercial losses and actual volumes of water sold, etc, which are often not reliably established.
- ❑ This data set is best determined by the Transaction Advisor. Where elements such as commercial losses or volume of water sold are not reliable, then these items should be estimated but acknowledged as requiring revision post contract award.
- ❑ It is difficult to enhance the data quality during a transaction as most of these data are historical operational and management accounting data – hence cannot be easily enhanced without implementing a new monitoring framework and procedures.

### **Availability and quality of water resources and accessibility of bulk water:**

- ❑ One would wish that comprehensive studies would be available on water resources, but in many cases, the reality is that water resources issues are inadequately addressed.

- ❑ Availability and quality of surface water can be measured, through sampling regimes and quality tests, and yield quantity estimated through long term monitoring of rainfall and river gauge stations. Assessment of groundwater, and particularly prediction of new ground water potential within locations can be more difficult.
- ❑ Best determined by specialist consultants through a thorough pre-bid study, using established good practice methodologies – these studies can readily be checked by bidders at the due diligence stage.

**Level of service parameters:**

- ❑ These data sets relate to the kind of politically and socially sensitive issues for which baseline data are usually inaccurate and yet which are often the driving factors behind the reform process, e.g. losses, service coverage, availability, affordability. As such they are susceptible to biased reporting for political reasons, for example, unaccounted for water figures are commonly underestimated, whereas level of service and population served are often overestimated.
- ❑ Whereas quality of water and the level of service would not take too long to assess, especially through the use of sample and pilot monitoring regimes, several years is usually required for items such as unaccounted for water.
- ❑ Best determined by specialist consultants through a thorough pre-bid study, using established good practice methodologies – these studies can readily be checked by bidders at the due diligence stage. It should be acknowledged however, that the bid data will be illustrative at the bid stage and that the level of service data will require to be gathered and refined by the operator during the initial years of the contract – in any event the data risk relating to unaccounted for water would have to be recognised in the contract and adjustment mechanisms included to allow for baseline revision.
- ❑ Ways to improve: Monitoring systems need to be in place for at least a year (to capture seasonal differences) and in most developing utilities sophisticated monitoring regimes are a luxury. To enhance data quality it is recommended that consideration be given to the design and establishment of a low cost, simple and robust monitoring regime for each key supply zone prior to the TA being engaged. This may require the World Bank to develop a suitable practical / best practice data monitoring guide for the utilities to implement with limited external assistance – perhaps some targeted capacity building activities. After the TA is engaged, this base information could be supplemented by a more sophisticated monitoring regime with selective use of metering and pressure monitoring to validate the utilities level of service findings.

**Infrastructure (asset base):**

- ❑ Infrastructures inventory is less politically sensitive, but can still be subject to bias and data inaccuracies – this is especially true for below ground assets.
- ❑ Gathering reliable data on underground infrastructure is difficult and, other than pipe network mapping, is best evaluated by the operator during the initial years of the

contract – as both time and good operational data on the network is needed to determine where best to target relaying or rehabilitation of the pipe network.

- ❑ Inventory registers and performance evaluations of above ground assets can be undertaken by the Transaction Advisor, and can be validated by the operators due diligence. Pre-bid it would also be prudent for the Transaction Advisor to establish with the client a thorough monitoring regime for operational data, such as power availability, resource availability, production metering, etc, to aid in establishing an accurate performance picture for the production assets – again a practical / best practice guide may be useful to ensure a standard, auditable procedure is applied.
- ❑ Ways to improve: Where pipe network mapping is missing, a number of cost effective techniques could be employed. The approach would depend very much on the extent of record keeping and the level of development of the city – varying from the availability of reasonable drawings and city plans to the extreme case of no drawings and perhaps no city plan. Again a good practice guidance note could benefit the utility and the Transaction Adviser to establish the best course of action.

**Staff:**

- ❑ Operators appreciate good data on staff, as staff costs usually represents a significant operational cost.
- ❑ Staff costs should not be difficult to assess and would be determined by the Transaction Advisor.
- ❑ Staff performance is more difficult to assess and may be better left to the operator post contract award.

**Customer base:**

- ❑ Municipalities do not always maintain accurate records of households served, especially where enumeration is incomplete, or where secondary provision and illegal connections are a significant feature.
- ❑ Customer base is not easy to assess, as it requires a global study, which is time-consuming, and must be updated on an ongoing basis.
- ❑ This element can be determined pre-bid by consultants, however, it is an expensive exercise that often cannot be meaningfully checked during due diligence. There is also the further question of whether the client should invest in a customer database at the pre-bid stage that may in any event be replaced on contract commencement by the operator's own billing and consumer register systems. It may therefore be prudent for the Transaction Advisor to undertake sample enumeration checks of the existing customer data base, perhaps supported by a customer satisfaction survey<sup>6</sup>, and from this provide indicative accuracy estimates to accompany the utility's own baseline data – this data risk would have to be recognised in the contract and adjustment mechanisms included to allow for baseline revision.

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<sup>6</sup> See Cook, Peter D. and Stevens, Jonathan, *Consumer-Oriented Reporting of Service Performance*, Second Interim Report, June 2004 and Draft Final Report, August 2004.

**Population (number, growth rate, density, number of households, number of persons per household, social distribution, incomes...):**

- ❑ Population figures are usually inaccurate as they usually depend on periodical census provided by the national statistics office, with an assumed growth rate applied. Political manipulation of census data is not uncommon.
- ❑ The population in the service perimeter can be assessed once the number of households served is established – again this may not be feasible pre-bid, due to the extent of the data gathering required, and hence the operator may be best placed to gather this data.
- ❑ Ways to improve: within the limits of a Transaction Advisor assignment, it is difficult to provide qualitative improvements to population data, and quantitative improvement is not a cost-effective option. Therefore, careful consideration should be given to the use of enumeration surveys as a means of validating the service population, in lieu of population data.

**Low-Risk Data Sets**

From this generic review the following data sets (Table 9 below) could be reliably established at pre-bid stage, assuming that some form of monitoring programme has been established upfront, and is effectively managed under the guidance of the Transaction Advisor.

**Table 9 - Summary table of data that could be reliably determined at bid stage**

<b>Summary of data that could be determined at bid stage</b>		
Value of bill payments received	Current water quality standards	Tariff structure, debt service
Volumes of bulk water sold	Production Capacity	Perimeter
Asset register (above ground)	Power availability	Pipe network mapping
Number of staff and labour costs	Cost of production per m3	Affordability and accessibility

Moreover, one should note that this list of variables alone is insufficient to allow the setting of adequate targets for a long-term contract.

**Uncertain Data Sets**

The following information (Table 10 overleaf) is likely to have some significant uncertainties at bid stage, but the information is required to establish the scope of service targets, investments and ultimately the tariff package – hence the Transaction Advisor should focus activity on collecting a ‘best available’ data set for these items at bid stage, but with the acknowledgement that the data can only be illustrative and will require the operator to collect and refine the data post contract award, but ahead of some form of revision. Typical of the data that would require the operator to refine the baseline post contract award, are:

**Table 10 - Summary table of data that can only be reliably determined after a few years of operation:**

<b>Summary of data that can only be determined after a few years of operation</b>		
Unaccounted for Water – physical and commercial losses	No of consumer connections Database of current users Population figures	Scope of investments required – especially detailed investment plans for below ground assets
Condition and performance of assets – especially below ground	Consumption patterns/ water demand, metering rate	Level of service and service targets
Water resources safe yield and seasonal reliability	Groundwater resources assessment	Service coverage and coverage targets

From this review, several conclusions can be drawn:

- It should be noted that, although the data items presented in Table 9 could be gathered to an adequate degree of accuracy at the bid stage, it is not often the case and particular care should be taken to improve data monitoring and gathering at an early stage of the transaction.
- In order to mitigate the risks entailed by the lack of good quality data at the bid stage, a transition period should be established at the beginning of the contract, during which data will be monitored and gathered. At the end of this transition period, a data review should take place.
- In order to take into account the differences between the data used at the bid stage and the review data at the end of the transition period, the impact of this change in baseline data on the contractual balance should be assessed by an Independent Expert.
- The transition period, data review process and adjustment and compensation mechanisms should be carefully designed at the transaction stage and clearly detailed in the contract.

**Finding:**

It is necessary to develop flexibility mechanisms in long-term contracts to cope with inaccurate data sets.

It is a high-risk strategy to use forecast long-term sectoral improvement targets as absolute, fixed contractual targets where critical bid stage data is poor.

## 8.0 Summary Recommendations for Improvement of Bid Data

The following package of measures is recommended to improve the data sets at bid stage:

- **Pre-TA capacity building and monitoring programme**
  - The aim of this capacity building would be to establish an adequate monitoring programme to gather robust information on the basic operation of the system prior to the transaction process. It is proposed that this should take the form of a practical / best practice guidance note for dissemination to municipalities, and detailing appropriate small-scale investments, collection techniques and pro-formas for recording critical data, and a short practical-based training course in the field. The advantage of establishing such a monitoring system up front is two fold: firstly, sufficient time could be spent on gathering data, capturing seasonal variations that are a feature of many developing environment scenarios, and so better informing the due diligence on scope and scale of operational problems, and secondly, by using a defined procedure, the data can be audited independently and assigned a confidence grade by both the Transaction Advisor and the bidders.
  - The data-gathering programme would be implemented by the municipality, and could be managed and/or audited by an Independent Expert, depending upon the level of available support funds.
  - We would advise the World Bank develop the capacity building and a good practice guide for data collection / package of essential actions for the municipality prior to transaction.
- **Investment in 'robust' bulk meters and key pressure monitoring points**
  - To be funded by the municipality, the World Bank or other IFI's – one critical element often not adequately known is the volume of water produced within the system. Frequently the installed flow meters are failed or uncalibrated and output is estimated crudely by pumping hours. The installation of key production and service reservoir bulk meters – of a robust design – is recommended at the earliest opportunity to supplement and validate the historical data provided. Additionally, the installation of simple stand-alone pressure recording is also worth consideration to establish availability of supply data (hours per day) at key nodal points in the network.
- **Initial Data Review**
  - At the earliest opportunity in the Transaction process, it is recommended that the Transaction Advisor undertake a short data review assessment, over a period of say two to four weeks, to identify the extent and veracity of available data. A data risk assessment approach may be suitable to assist this process. The objective of the Initial Data Review would be to inform the planning of the Transaction period, including the phasing and extent of data monitoring and collation programmes, as well as any specific studies required. Perhaps of equal importance, the Initial Data Review would inform the Transaction Advisor on the likely data management issues within the procurement and contract and may provide early influence on the decision

making process for the type of contract form appropriate to the status of the utility.

- **Establishment of operational monitoring systems at the transaction stage with TA / Expert Review**

- Very often Transaction Advisors gather data on the utility without any supplementary monitoring programme in place, with significant reliance placed on dubious historical data, and with significant likelihood of error. An operational monitoring system should be established at the transaction stage, in order to implement an efficient programme of data gathering for the purposes of corroboration, validation and verification of the historical baseline. This monitoring system may include pressure monitoring of critical points within the pipe network and monitoring of specific pilot zones to validate losses and water usage figures, and its primary focus would be to validate the critical data sets needed to establish the level of service and production data baselines.
- This monitoring system would be implemented by the municipality, under the guidance and managed by the Transaction Advisor, and possibly audited by an Independent Expert.
- The World Bank is recommended to develop a good practice guide for operational monitoring between transaction commencement and bid. Such a guide is recommended to provide a consistent and auditable approach.

- **Provision of timely data packages**

The period between the bid stage and the start of the contract can often be in excess of a year (see Diagram 4 overleaf). During this prolonged pre-award period, the service provision and the associated information sets continue to evolve. It is therefore advisable either to reduce the time between the data collection and the bid, or else to continue to monitor this evolution of data to enable a refined data set to be introduced at the bid negotiation stage.

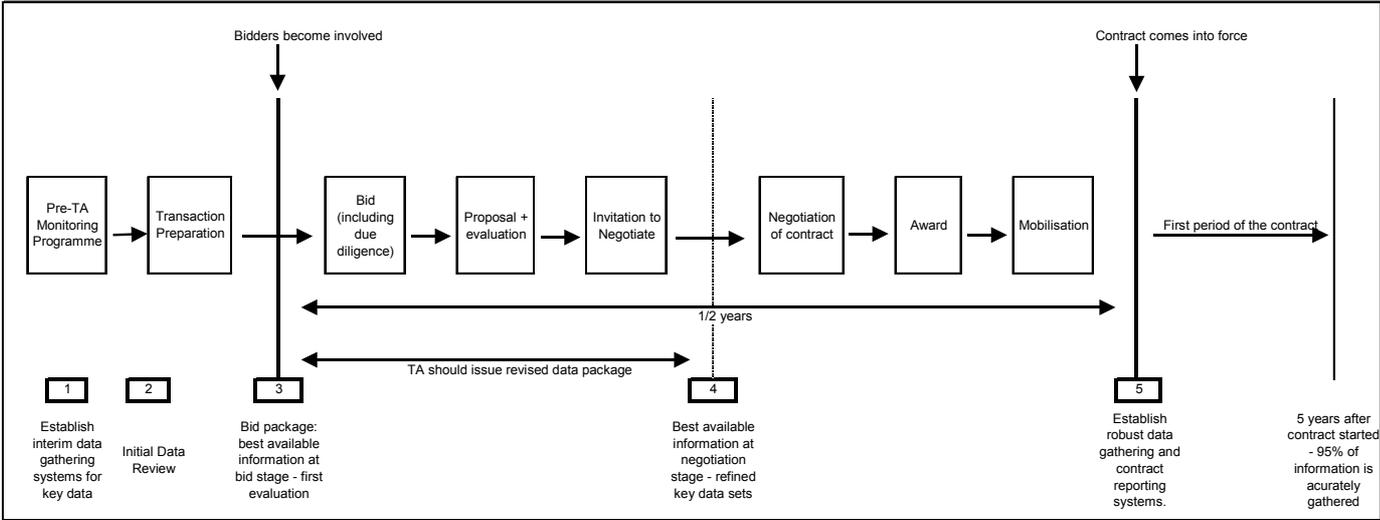
The two options are:

- Fast track transaction approach: use the output of the Initial Data Review to plan a 'fast track' transaction schedule, with concurrent activity on the normal TA tasks of contract design, stakeholder consultation, policy dialogue, finance modelling and with data collection phased to complete as near to the bid package issue as possible. Clearly this approach would require a relatively 'trouble-free' transaction with a municipality of sufficient capacity to manage the demands of the process expediently - it is recognised that this may not be possible in all cases and hence a second alternative is proposed:
- Provision of a second data package at negotiation stage: here the Transaction Advisor will continue to oversee operational data collection after the issue of the 'best available' bid package to the bidders. A refined data package would then be released to the preferred bidder at the negotiation stage so that the most up-to-date information is used as the basis of the final agreement.

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With these systems and programmes established upfront, the quality of data sets gathered before the contract starts is likely to be improved, provided that these programmes have been established long enough in advance, and that they have been adequately implemented and managed through a robust procedural framework.

**Diagram 4 - Evolution of information during the bid stage and the first period of the contract:**



**Notes:**

- 1 - Establishment of pre-transaction monitoring system
- 2 - Initial Data Review
- 3 - If not in place yet, establishment of monitoring systems and data gathering by TA.
- 4 - Refinement of key data.
- 5 - Establishing monitoring regimes within the contractual framework.

In many circumstances, there are no robust or complete monitoring systems in place, and hence, we recommend that it be made part of the transaction advisors' role to provide the establishment of a system for recording key data.

## 9.0 Impact on Bid Strategies

The analysis indicates that there are a number of options for the bid strategy, which are impacted by the data quality issues discussed. The basic bid strategy choices are:

- Make it a bid requirement for the bidder to assume the risk by pushing the responsibility for evaluating data onto bidders' due diligence → higher risk, higher likelihood of gaming at bid stage and risk of a significant baseline adjustment later. This has been the conventional approach to many past concessions.
- Allow the operator to gather high uncertainty data once the contract has come into force and establish targets only after a couple of years operation → this would require new thinking on the type of contract approach and contracting relationship. An exploration of such ideas is presented by ORT sub-group #3<sup>7</sup>.
- Concentrate effort on betterment of the data by establishing pre-transaction and/or pre-bid monitoring regimes to validate key data and prepare forecast targets on the basis of 'best available' data. After several years of operation, review and refine the data baseline and adjust the contract accordingly through a robust adjustment mechanism. The issue of how to prevent gaming still must be addressed, and this is reviewed by the concurrent ORT #3 project on Bidding Procedures<sup>8</sup>.

The first option does not appear attractive in the current climate of risk aversion. It is likely that the third option will prevail in the short term, whilst the ideas behind the second option are further explored, developed and tested.

In most developing countries the forecasting of performance and investments is highly unlikely to be robust under the conventional concession model, as much of the baseline data required to develop long-term service target forecasts is often of suspect quality. This must imply the requirement for a periodic adjustment, and a choice between the latter two options, i.e.:

→ Design contract provisions which attempt to manage with transparency the downsides of such a baseline revision.

Or

→ Develop a new contracting strategy that accepts that targets cannot be defined until there is a review of key data.

The deciding factor on which option to pursue will likely be the extent of uncertainty in forecasting of service targets and investments, illustrated in the simple decision tree in Diagram 5 overleaf.

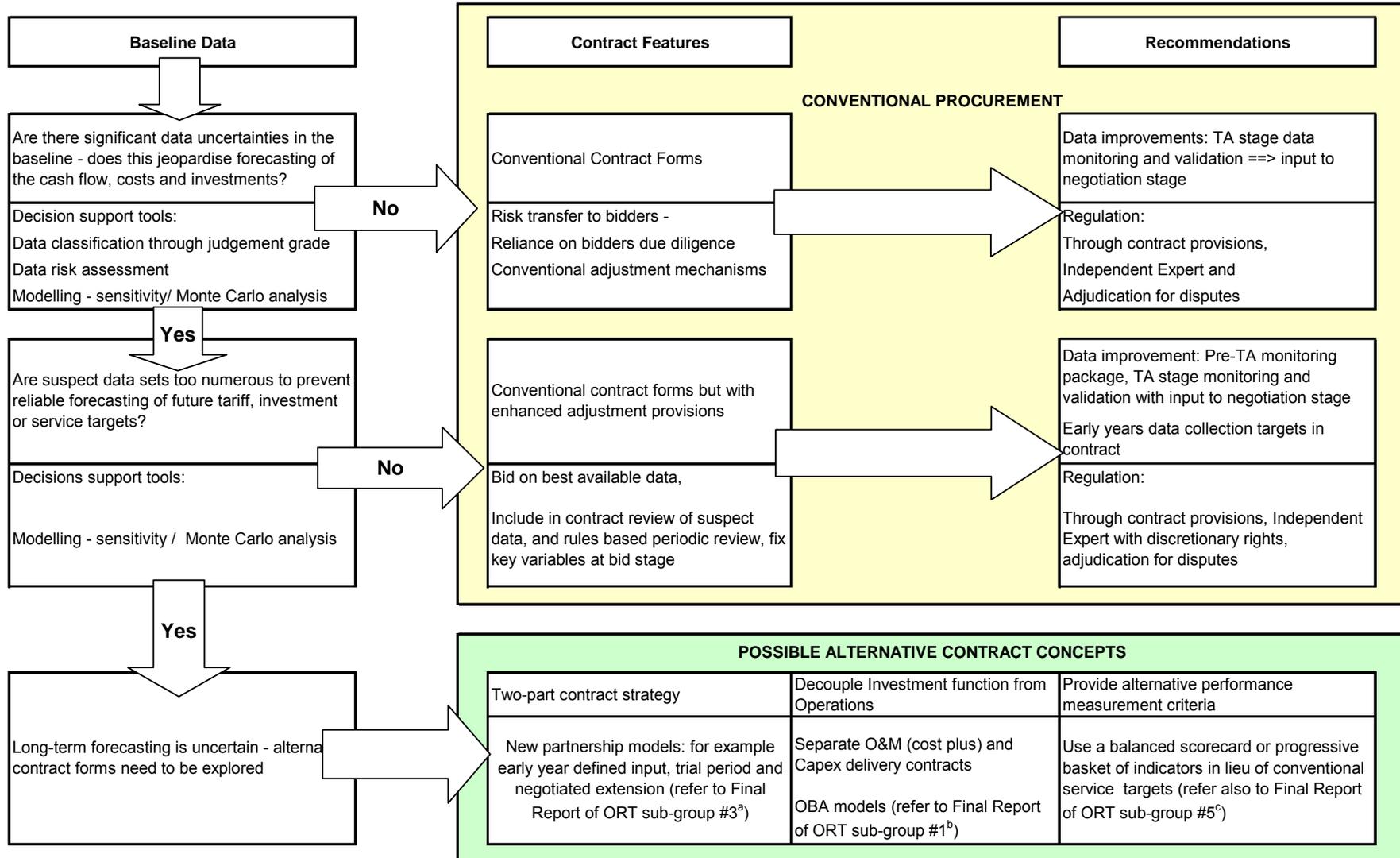
The key question is whether the suspect data sets are too numerous to allow for forecasting of future tariff, investment and service targets. If not, the adjustment to baseline data is an option to consider, but if so, then alternative contracting routes may be the better option to explore.

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<sup>7/8</sup> See Shugart, Chris, *Procedures for the Selection of the Concessionaire*, Draft Final Report, August 2004.

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**Diagram 5 - Summary of Potential Options**



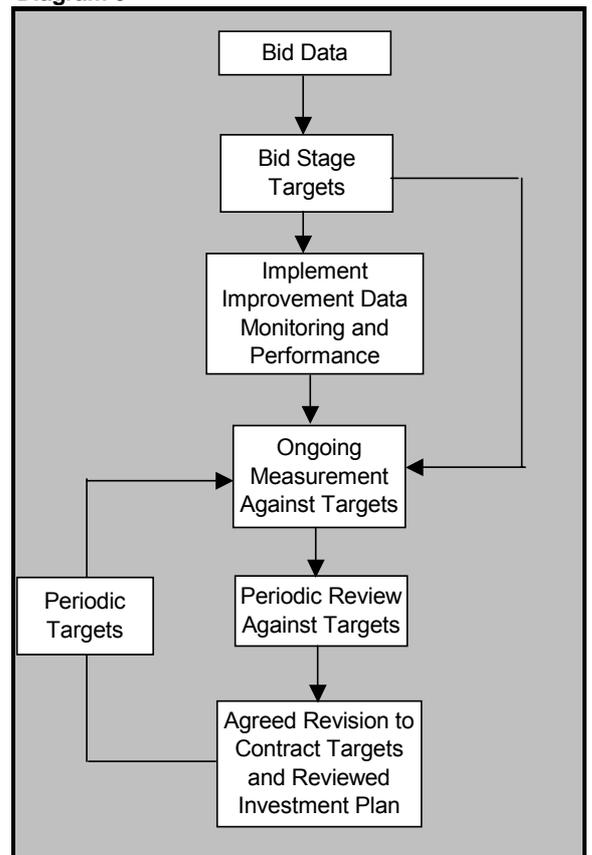
a. Shugart, Chris, Procedures for the Selection of the Concessionaire, Draft Final Report, August 2004 and Final Report, November 2004  
 b. Erhardt, David, Key Contract Provisions for Long Term PPP in the Water and Sanitation Sector, Castalia, Second Interim Report, June 2004 and Final Report, August 2004  
 c. Cook, Peter D. and Stevens, Jonathan, Consumer-Oriented Reporting of Service Performance, Second Interim Report, June 2004, Draft Final Report, August 2004 and Final Report, November 2004

## 10.0 Adjustment and Mitigation Options

To manage imperfect data sets it is apparent that agreement on flexibility and adjustment mechanisms in the contract is essential. Some potential risk mitigation options have been explored with input from the peer review team and other operators (Suez Environment, Veolia Water and Thames Water). The outcomes are presented as recommendations in the next paragraphs and all these recommendations take into account the following assumptions:

- The conceding authority should agree that baseline data on which the bid is based are inaccurate to some degree and will have to be reviewed and adjusted over time; periodic review and refinement of baseline data is therefore fundamental in one way or another.
- Co-contractors should therefore agree on a minimum set of clear and reasonably ambitious objectives and on the procedure and timetable for regular revision and adjustment of targets and the associated impact on contractual obligations and adjustments.
- Where focus changes from bidding to ongoing contract management, the data used to determine contractual performance, and especially contract performance indicators or measures, become of primary importance.
- When monitoring operator's performance, those indicators based on data that has significant uncertainty in the first years of operation should not be linked to contractual compensation in the early years of the contract.

Diagram 6



## **10.1 Articulation between bid and first period of the contract**

The key issue is to articulate the data sets used at the bid stage (to evaluate the bidders and choose the most appropriate offer), and those used during the contract itself to set adequate long-term objectives, to forecast management strategies, and to monitor the operator's performance. The principles proposed below have been developed in discussion with the operators and aim at finding some solution to meet this issue.

### **Principle 1: Incremental increase**

The client would agree a set of specific key indicators for which reasonable aspirational targets can be set for the duration of a long-term contract based on a starting point derived from best available data at the bid stage. These targets will be reflective of the sectoral reform and performance improvements that the client is seeking. For each indicator, the Transaction Advisor would forecast the trend showing how the indicator is expected to evolve over the period of the contract. This forecast is the bid stage performance target, which the operator would prepare his bid against, and the incremental increases in performance over the duration of the contract are fixed.

For example, instead of targeting an absolute level of 35% of unaccounted for water by the end of a specific monitoring period, the target would be an incremental improvement of 8% over the period. If the assessed level of unaccounted for water reveals the baseline to be inaccurate, it will then be easy to transpose the improvement made by the operator to the correct values and to assess his performance against these more efficient and accurate targets.

After several years of improved data collection post contract award, the more reliable data sets would establish the true position of the performance indicator, and the incremental improvement profile would be rebased relative to the actual versus predicted position of the baseline data. Here the original incremental improvement profile would be retained. Hence, the desired 'degree of improvement' is retained within the contract objectives.

The co-contractors would agree a timeframe, within which the indicators would be periodically reviewed and the targets revisited. An adequate timeframe for periodical review would be between 2 and 5 years, depending on the particular parameters of the contract and of the utility status, when accurate operational data should be available with a higher degree of confidence. This timeframe would be clearly stipulated in the contract.

### **Principle 2: Progressive replacement of high uncertainty data used at the bid stage**

Principle 2 is to use the 'best available' data at the bid stage to secure the best commercial offer, but then progressively refine those few data sets with a known and acknowledged high uncertainty, with a focus on early contract activity in developing a robust data set.

At the bid stage, the conceding authority would agree the key indicators and forecast a picture of the aspirational service improvements at the bid stage. The operator would be selected on the basis of the best commercial proposal in response to these objectives, and the bid response would include a short term fixed investment profile with early year investments identified.

After the contract award, the baseline would be reviewed and progressively refined over the first years of the contract, and the operator would be contractually committed to gather accurate data on the utility operation as well as executing the agreed early year investments.

After the initial contract period, say 5 years, the co-contractors would agree via a rules based adjustment mechanism or negotiation any required revisions to the investment plan and associated performance targets for the remainder of the contract. The adjustment mechanism agreed at the bid stage would allow for the most appropriate reallocation of the total investment sum that formed the basis of the original offer.

Where the high uncertainty data sets are too extensive and numerous to allow for sensible forecasting, then an alternative strategy must be employed whereby the input targets are set but forecast service standards are not determined until completion of the early year transition period – refer to ORT sub-group #3 for one exploration of this concept<sup>9</sup>.

## **10.2 Structure of the revision/transition period**

From the foregoing analysis, one prerequisite feature of any long-term contract should be the setting of a transition or revision period at the beginning of the contract. This period would be a transition period during which accurate data will be gathered concurrent with the operation of the system, in order to adequately populate the baseline data set.

Some guidelines are proposed:

- The transition time frame must be clearly defined in the contract. An adequate time frame for a transition period is likely to be between 2 and 5 years, with the timeframe largely a function of the status and level of preparedness of the specific utility in question. Indeed in excess of 2 years is usually required to gather robust information on parameters like unaccounted for water, with different periods needed for different situations (flexibility is needed here).
- As certain key data sets used during this initial period will not be accurate, it would be preferable to set input based targets in lieu of performance outputs for the early years. These targets should be specified in physical terms: lay a certain number of km of pipes, renew above ground assets at a specified treatment plant, invest a specified sum in mechanical and electrical refurbishments, install x meters and renew y meters... Such short-term targets could also be set within an 'output-based aid' framework if subsidies form a part of the operator's revenue stream<sup>10</sup>.
- Some milestone actions aiming at gathering data should be added to the input based targets, for example the following actions may be appropriate in data poor utilities:
  - Procure mapping or aerial photographs for all urban areas over 10,000 estimated population;
  - Complete house count survey within service area: identify and map number of connections, number of households within 250m of a shared connection, house

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<sup>9</sup> Shugart, Chris, *Procedures for the Selection of the Concessionaire*, Draft Final Report, August 2004 and Final Report, November 2004

<sup>10</sup> See Erhardt, David, *Key Contract Provisions for Long Term PPP in the Water and Sanitation Sector*, Castalia, Final Report, August 2004

- count without direct access to piped supply, number and location of standpipes and water tanker points;
- Complete supply zone demarcation;
- Establish zonal metering monitoring regime: procure and replace meters,
- Complete production monitoring programme and establish key production records reporting; install bulk meters at each water production site and service reservoir;
- Complete consumer enumeration for each system;
- Establish consumer complaint database;
- Establish level of service monitoring regime;
- Establish demand/ loss management regime;
- Implement programme of sanitation education measures for new connections;
- Commission integrated water resources development plan.
- Long-term performance improvement targets, output based, could be efficiently and accurately defined or revised at the end of the transition period.

### **10.3 Revision of baseline data**

During the first years after the contract has come into force, the operator will gather increasingly accurate data along with a better understanding of the operation of the system. This new information will regularly be reported to the conceding authority and/or regulatory authority when applicable. This information is usually audited or crosschecked in some way by the conceding/regulatory authority. As this baseline refinement process will likely lead to adjustment of targets and of contract parameters, and as this procedure can lead to divergences between operator and conceding authority expectations, the procedure to agree the contract adjustment figures should be clearly stated in the contract.

#### **Who should agree on the new values?**

When the regulatory capacity and independence appear to be poor, or, for example, when the regulatory agency has only recently been established, it is advised to engage an Independent Expert, comprising an agreed independent panel or consultancy firm. The modus operandi for the Independent Expert should be agreed at the negotiation stage and clearly stipulated in the contract, and some provisions should clearly determine how the Independent Expert is appointed, who/what mechanism will fund the Expert, what the tasks or terms of references of the Independent Expert are.

#### **What should be the timeframe for revision?**

An adequate timeframe to agree on revised data sets depends on the specific parameters of each contract, e.g. nature of the contract, its duration, state of preparedness of the beneficiary utility, status of the service provision at the beginning of the contract, etc. Moreover, some data sets will be refined every month, some others will be revised only after a year, and some data sets will need even more time to be accurately gathered. In consideration of these factors,

it is proposed that an adequate timeframe for agreement on the new values is between 2 and 5 years, phased with the transition period. Whatever timeframe is chosen, it should be clearly stipulated in the contract.

#### **Key parameters and methods of evaluation**

Different methods of evaluation and calculation often lead to different results and to disputes. Key parameters that will be measured and methods of evaluation should be pre-agreed and clearly specified in the contract. One possibility could be for the operator to prepare and propose a schedule of techniques for evaluation, along with the bid proposal, that would be included in the contract. The Transaction Advisor should not dictate in any case how best to measure data values, unless these are part of the pre-bid review by the bidders and are adjusted accordingly in response to bidder comment.

### **10.4 Subsequent contract adjustments and compensation through baseline revision**

To undertake an adjustment of baseline data sets within a contract, the co-contractors will first agree on the new information sets and key parameter values, as discussed in the section above – this being essentially a ‘technical assessment’ to allow determination of the new baseline.

The second step in the process is to agree, through the contract mechanisms, the impact of this refined data baseline on the contract targets, service parameters, investments and, most importantly, operator’s remuneration, all of which should be reflective of the new baseline – this being a ‘contractual determination’. Historically, this matter is usually the most subject to disputes and also the area most lacking in definition within contract provisions. To avoid any divergence, these ‘contract adjustment’ mechanisms should be agreed at negotiation stage and be clearly defined in the contract.

Moreover, one common conflict issue on concession contracts is the adjustment of tariff – as political considerations, ability to pay limits and pro-poor protection policies often provide strong disincentives for regulators and conceding authorities to implement the full tariff increase required - even where there is a contractual obligation to do so.

A potential avenue to alleviate the impact of such social issues on the adjustment of contracts is to consider a suite or package of adjustment measures that, singly or in combination, could be applied to redress the financial balance of the contract without a full tariff increase. Such measures would include adjustment to the amount of investment or level of service targets, or reprioritise, amend, partially defer or rephrase the investment programme and targets.

In developing such a mechanism, it is advised to meet the issues raised above, and also to:

- Make sure that such a mechanism will not be abused whereby the path of least resistance is always followed, perhaps by restricting its application to no more than once or twice during the life of the contract;

- Not over elaborate the adjustment mechanism to ensure that it remains simple and robust, efficiently and transparently linking the level of service, revenue and investment needs.

To provide clarity to this issue, a rules-based procedure is proposed, based on sector good practice, for evaluation of level of service and investments amendments that then feed into the conventional tariff adjustment formula<sup>11</sup>.

This approach can only work if the new tariff is universally accepted politically and socially. Experience shows that some compromise will be required in order to limit the extent of tariff increase to acceptable levels. This process of compromise is by definition a negotiation and would focus on rephrasing or adjustment of some of the commitments to level of service targets and investments.

Hence, it is concluded that the review mechanism would be partly rules-based, partly mathematical for tariff adjustment, and will also have an element of negotiation in order to arrive at a mutually satisfactory outcome. This again highlights the need for an Independent Expert to guide this process without conflict.

### **1. Adequate timeframe for adjustment**

The contract should clearly define a timeframe for revision of the targets and adjustment of the contract parameters, which should be carefully chosen to synchronise with the wider programme of regulatory review and reporting timetables, and if a transition period is set, adjustment mechanisms should coincide with the end of this transition period.

### **2. Responsible authority**

The contract should clearly specify the responsible authority that will adjust the targets. If the co-contractors pre-agree that this should be the task of the Independent Expert, the contract should clearly specify how the Independent Expert is appointed, who/what mechanism will fund the Expert, what the tasks or terms of references of the Independent Expert are.

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<sup>11</sup> See Erhardt, David, *Key Contract Provisions for Long Term PPP in the Water and Sanitation Sector*, Castalia, Final Report, August 2004.

**3. Procedure**

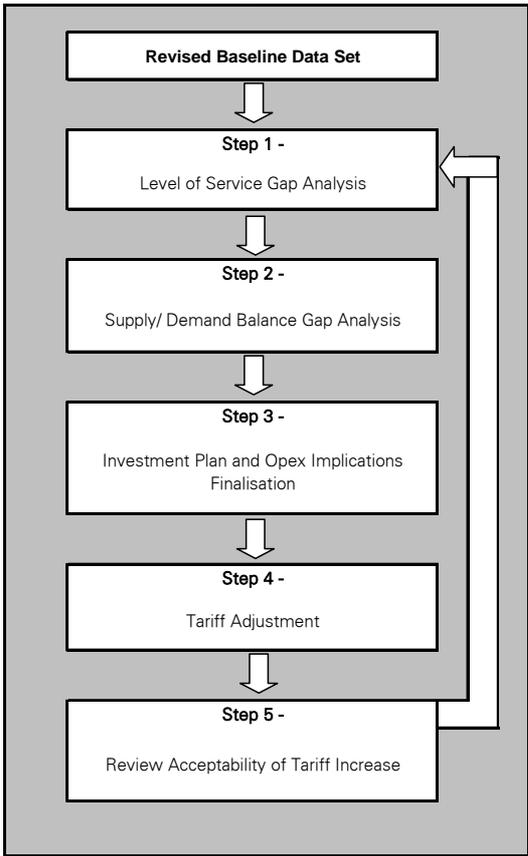
One weakness identified in the case study contracts reviewed is that the mechanism for periodic adjustment of the contract variables is not well defined, other than the calculation of tariff adjustment<sup>12</sup>. A proposed refinement to the provisions within a long-term contract is therefore a robust procedure for implementing a periodic adjustment, following the early years data review and transition period. The outline for a more extensive adjustment mechanism is proposed in this report to inform thinking on this topic rather than as a complete solution – hence further development of these ideas is recommended; although to do this subject proper justice would require an extensive piece of further work, which is beyond the scope of this study.

The proposed mechanism draws on typical review frameworks used within the utility sector and follows a number of discrete logical steps as detailed in Diagrams 7 below and 8 overleaf. The adjustment model assumes that the water utility is a level of service (consumer) driven business.

The key steps are:

1. Level of Service Gap Analysis – determine from the new baseline data the extent of improvement required to achieve the aspirational level of service provision targets as set by the municipality at bid stage.
2. Supply/Demand Balance – determine from the new baseline data the revised demand forecast profile and the infrastructure capacity enhancements to the supply that would be required to meet the demand, including allowance for efficiency improvements.
3. Investment Plan and Opex Implications – from steps 1 and 2 above, derive the investment plan and phasing of investments required to fulfil the level of service and demand improvements. Assess the change in operational and maintenance costs that the investment plan will incur when implemented.
4. Tariff Adjustment – use the data from steps 1, 2 and 3 to process the tariff adjustment using the conventional formula for tariff amendment. It is suggested that the Independent Expert executes, or at least oversees and audits, this process and recommends the new tariff structure to the co-contractors.
5. Review Tariff Acceptability – the political acceptability of the tariff increase is reviewed and, if not acceptable, the Independent Expert will oversee an iterative review of the

Diagram 7 - Five-Step Approach



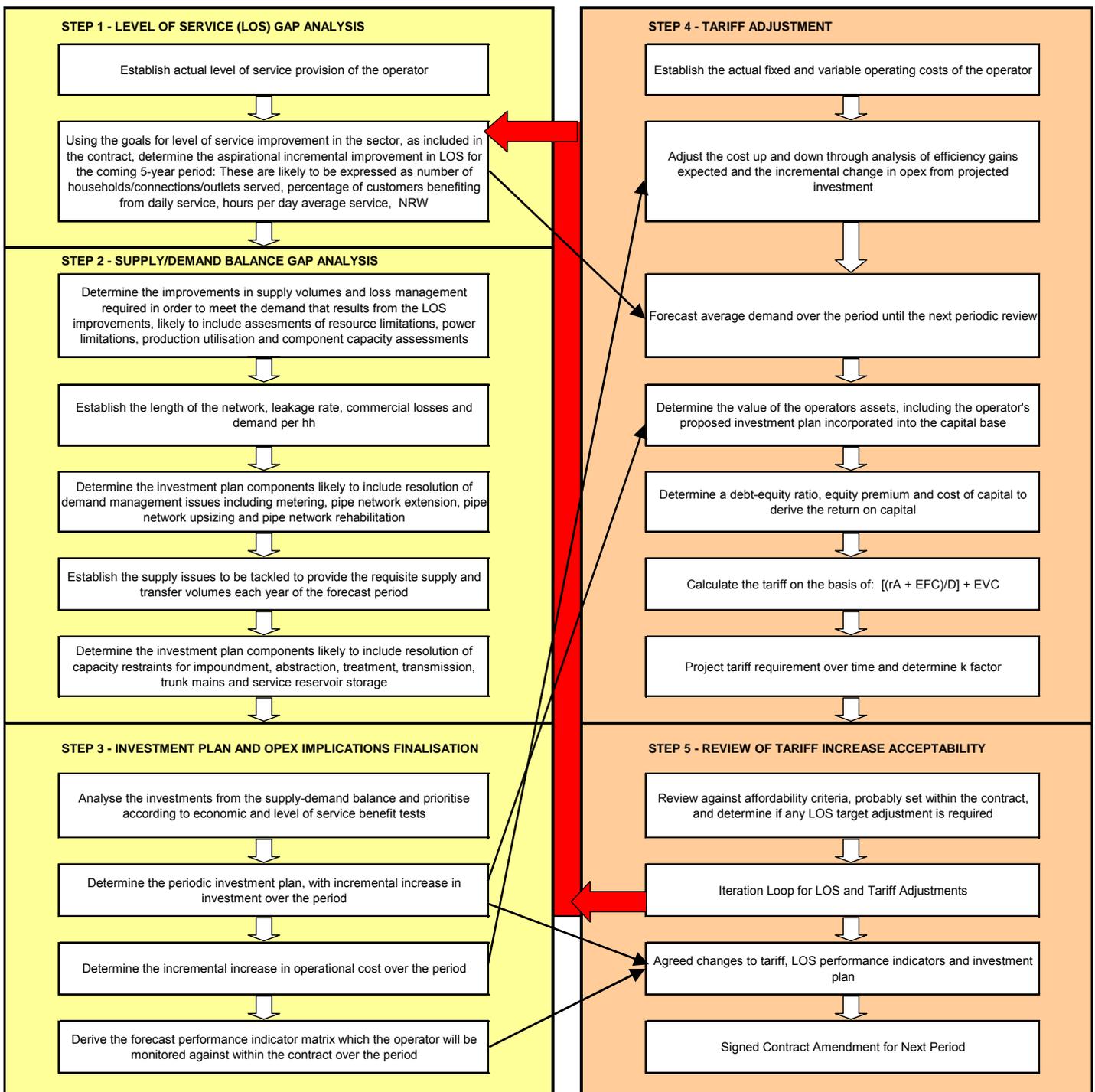
<sup>12</sup> See Erhardt, David, *Key Contract Provisions for Long Term PPP in the Water and Sanitation Sector*, Castalia, Final Report, August 2004.

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options with focus on adjustment of the extent and phasing of the level of service targets and the related impact on supply/demand/investment and Opex. The Independent Expert would again audit the outcomes and then, acting within the limits of his assigned discretionary power, recommend a compromise package of tariff, investment and level of service for agreement.

The final tariff structure, and associated level of service targets and investment plan, would be subject to a final negotiation between the co-contractors to achieve the final compromise solution.

**DIAGRAM 8 - PERIODIC CONTRACT ADJUSTMENT MECHANISM - RELATIONSHIP BETWEEN TARIFF, INVESTMENT AND LEVEL OF SERVICE**



#### **4. Financial model**

One pre-requisite for this approach is a financial model that links the baseline data with targets, level of service, investments, tariff and cash flow profile. A second pre-requisite is that the co-contractors are both happy to use the model and will accept and abide by the adjustments to the various outputs from the baseline revision.

Historically, bespoke financial models have been used to rebase tariff on long-term contracts, with varying degrees of success, and which may have been instigated through the contract, often provided at bid stage by the operator, imposed by the transaction advisor pre-bid, or else by the regulator post bid.

Furthermore, feedback from the operator focus group discussion highlighted that the chances of non-contentious application of contract adjustment models is enhanced if the model is calibrated such that the model behaviour is 'close enough' to the reality of the utility operation that the results can be accepted with confidence, and be flexible enough to accommodate and reflect the changes that do occur, through evolution of data as well as due to step change events.

From this discussion, it is considered that a clear model, transparent to both parties, should be pre-agreed at bid stage and fixed in the contract. This model, which will define the cash-flow curve and remuneration framework, should be flexible, calibrated and auditable.

#### **5. Subsequent baseline revision and data management**

Once the initial transition period and baseline adjustment is undertaken and the performance targets have been adjusted on the basis of this improved data set, the contract can progress on a more conventional basis of output service targets, with associated penalty and incentive mechanisms. However, it must still be recognised that the quality of data sets, monitoring and reporting regimes will continue to improve and evolve over time.

It may be prudent therefore to incorporate further baseline data review periods within the contract, albeit with increasingly narrow thresholds of acceptable error. Alternatively, another flexible way to avoid the need for routine rebasing would be to define margins of tolerance within which the contract parameters do not need to be adjusted. Here the co-contractors would agree upper and lower margins of tolerance for key data items/indicators. These pre-agreed margins are defined as the critical point which, when transgressed, entail a significant increase/decrease in obligations to the operator or the conceding authority to fulfil their respective contractual responsibilities. Within this margin, an error of estimation does not lead to any adjustment of the contract stipulations and parameters – here the operator 'pays' for margin of tolerance above the target value and the client 'pays' for any margin of tolerance below the target value. Outside the allowable margins, contract parameters and stipulations should be adjusted through a partial or full baseline revision. Ideally, these margins should be pre-agreed and clearly specified for each indicator in the contract, the validity of which would be subject to reviews at each review period.

## 10.5 Alternative performance measures/indicators

A further approach, which is an untested idea, but perhaps worthy of future consideration, is to develop an alternative system of performance targets that uses only the more reliable data sets. This may have an application particularly for 'data poor' utilities where reliable data sets are some way off realisation.

The proposal aims to address a number of data management issues within a clear framework for performance target setting and monitoring. The key features proposed are:

- Reflective of overall utility performance: technical, commercial, financial, level of service and consumer issues should be captured (including new customer focussed indicators if appropriate<sup>13</sup>), and focuses on continual improvement in a multitude of functional areas.
- In poorly run urban systems and/or during the initial or start-up period of a long-term contract, robust surrogate indicators could be employed with a focus on high level data, assessing the performance of the service provision at the macro level, and where good data are lacking and service standards are not otherwise possible to forecast.
- Progressive replacement of increasingly data sensitive and complex indicators can be implemented as data quality is improved.

The proposal is to consider the use of a basket of performance measures, which are normalised and aggregated by means of a points scoring system. The resultant 'performance score' would be reflective of the status of the water utility. Forecast improvements could also be set within the contractual targets by means of the scoring system.

By using a significantly wide and varied basket of measures, it is also hoped that the aggregation exercise will to some degree compensate for individual indicator errors due to inherent baseline data inaccuracies, and thereby reflect better the true performance of the contract.

To assess the performance of water services provision by the operator in this way, a simple service performance monitoring matrix is proposed, as presented in Table 11. The perceived benefits of this approach are:

- Monitoring is focussed on a limited number of indicators (20 items are proposed for clarity and simplicity) that are easy to measure with confidence even in the initial years of reform when data monitoring systems may be incomplete. This approach aims to save the conceding authority time, effort and money that would otherwise be spent trying to collect a wide range of data of variable quality, accuracy, reliability and usefulness.
- An appropriate choice of indicators could allow the utility management to quickly identify at high level the main problems and dysfunctions within the systems, and inform the judgment on which improvement issues should be addressed first and foremost. The combination of indicators proposed here has been chosen as these indicators collectively represent a picture of a typical operational performance.

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<sup>13</sup> See Cook, Peter D. and Stevens, Jonathan, *Consumer-Oriented Reporting of Service Performance*, Second Interim Report, June 2004, Draft Final Report, August 2004 and Final Report, November 2004.

Alternative selections could be chosen depending on the status and level of development of the considered system and on the priorities of the conceding authority – examples of wider alternative sets of indicators are provided in Annex 7, Appendix 1, and in other works such as Cook and Stevens<sup>14</sup>. The selection of indicators could also be based on indicators found to be most important, or useful, to the decision makers in long-term contracts – Cook and Stevens<sup>15</sup> provide an analysis and recommendations in this regard.

- The minimum level of service improvement expected for each parameter in a defined year is converted to a score. The aggregated score provides a means to set targets and measure the incremental service improvement over time, instead of an absolute level of performance, especially during the first years of the contract when data on the service parameters are not accurate enough to establish robust forecasting. This method allows an assessment of the operator's performance in the early years even for 'problem' data items like unaccounted for water where surrogate indicators can be used (a new indicator – Loss of Revenue Potential - is proposed and equates to: revenue received/ nominal value of water produced). This aggregated score is indicative of the overall performance status and operational 'health' of the utility. By aggregating scores in this manner, the overall efficiency of water system operation is reflected and this can then be readily benchmarked against other systems, operators or utilities.
- Contract penalty mechanisms could be more fairly applied, as instead of implementing penalties for failing to achieve individual parameters, the aggregation of score across the basket would mean that out-performance in some parameters could balance any shortfall. In data poor scenarios – where single parameter definition is risky in the early years – this approach would allow the assessment of the general improvement in operational efficiency of the system, instead of measuring and adjusting on individual parameters.

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<sup>14</sup> See Cook, Peter D. and Stevens, Jonathan, *Consumer-Oriented Reporting of Service Performance*, Final Report, November 2004, Table 10.

<sup>15</sup> See Cook, Peter and Stevens Jonathan, *Development of an Appropriate Monitoring Framework for Regulatory Oversight of Water Utilities*, Bank Netherlands Water Partnership Water Supply and Sanitation Windows Program, March 2004

**Table 11 - Suggested performance targets for year 1 of an illustrative contract:**

Year 1					Score
E 400	Working Ratio	Loss of Revenue Potential	Collection Ratio	Debt Service Ratio	255.00
	80.00%	38.00%	90%	55.00%	
	50.0	70.0	90.0	45.0	
C 400	Metering Rate	Service Continuity	Number of Complaints Responded within 30 days	Affordability	196.43
	25.00%	8	75.00%	0.5%> . <3%	
	25.0	33.3	75.0	63.1	
S 400	Available Production Capacity	Production Utilisation	Power Limitations	Resource Limitations	273.00
	390	55.00%	45.00%	15.00%	
	78.00	55.00	55.00	85.00	
T 400	Pipe Network Mapping	Water Resources Assessment	Asset Register Completion	Consumer Enumeration	350.00
	100.00%	60.00%	100.00%	90.00%	
	100.00	60.00	100.00	90.00	
Q 400	Chlorine	Turbidity	Bacteriology	Filtered Water	377.00
	95.00%	95.00%	95.00%	92.00%	
	95.00	95.00	95.00	92.00	
<b>Total Aggregated Performance Score</b>					<b>1451.43</b>

**Note on the system of scoring:**

In Table 11 above each individual performance indicator has been converted to a score between 0 and 100 in accordance with a scoring system (detailed in Annex 7 in Volume 2). The purpose of the scoring system is to allow the recorded scores to be normalised against a notional or aspirational benchmark standard, and an aggregated score then determined combining all 20 indicators.

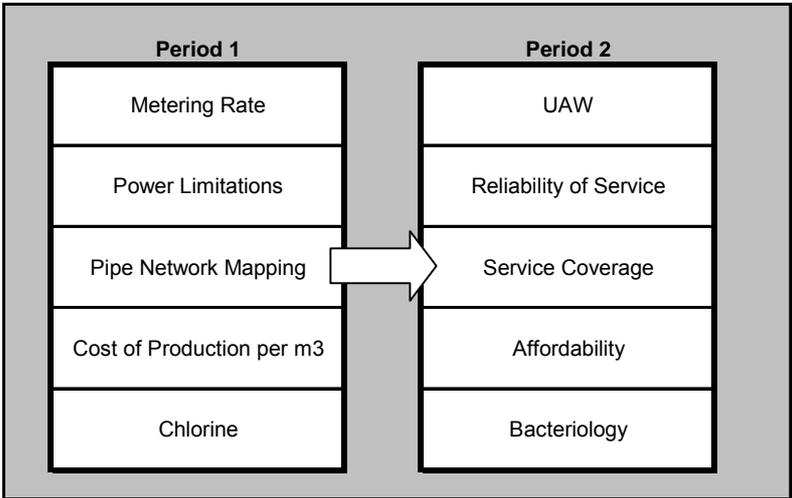
**Table 12 - Example of guidance on completion of monitoring matrix:**

Performance items	Calculation	Scoring	Formula
Production Utilisation	Total volume of water produced/total design capacity of the works	100 pts = PU = 100% 0 pt = PU = 0%	Score = PU x 100
Loss of Revenue Potential	Annual bill payments received/value of water produced at average tariff	100 pts = LRP = 100% 0 pt = LRP = 0%	Score = [1-(LRP-0.2/0.6)] x 100
Collection Ratio	Revenue collected/revenue billed	100 pts = CR = 99% 0 pt = CR = 0%	Score = CR x 100

The advantage of this type of monitoring scheme within a contractual context is that it could be adjusted over time along with operational and data quality improvements, and as such may be used to:

- Progressively tighten targets;
- Increase the number and sophistication of indicators at each review period;
- Progressively replace some of the surrogate indicators, as better data becomes available, the principle of this as illustrated in Table 13 below.

**Table 13 - Illustration of progressive replacement of surrogate indicators with improved data quality:**



Here the successive five-year targets would be reassessed at each periodic review and any incentive/penalty mechanism linked to achievement of the annual performance scores required. This option is discussed in more detail in Annex 7, Volume 2.

## 11.0 Summary Recommendations

Considering the principles and recommendations discussed in the preceding sections, a contractual arrangement able to better manage the inherent risks of poor data quality at bid stage could comprise some or all of the following components:

- Pre-Transaction Stage
  - A pre-TA capacity building and monitoring programme would be established in order to gather robust information on the basic operation of the system prior to the transaction process. It is advised that the World Bank funds and develop a good practice guide for data collection / package of essential actions for the municipality prior to transaction.
  - 'Robust' bulk meters would be installed, as well as pressure monitors at key pressure monitoring points.
  
- Transaction stage
  - At the very beginning of the transaction stage, a short Initial Data Review would allow the Transaction Advisor to assess the extent and veracity of available data.
  - The phasing of the transaction activities would be planned such that data collection is undertaken as near to the bid phase as possible.
  - Operational monitoring systems would be established as early as possible during the transaction stage. These systems would be implemented by the municipality and managed, or at least audited, by an Independent Expert.
  - For bid purposes, a set of 'best available' baseline data would be proposed to the bidders. The successful bidder would be chosen on the basis of best commercial offer, in response to the baseline data presented. After the bid, the bid stage baseline data would be refined progressively, and an improved, revised baseline collated within a pre-agreed timeframe.
  - A second data package would be provided by the Transaction Advisor at the negotiation stage if the transaction period were extensive.
  - Agreement on the following contract provisions is recommended at negotiation of the finalised terms and conditions of the contract:
    - Adequate time frame for the transition period, between 2 and 5 years
    - Data revision model: indicators that will be revised, method of evaluation
    - Rules-based adjustment and/or compensation model
    - Financial model

- Designation of an Independent Expert who will supervise revision of data and adjustment of contract parameters and targets according to pre-agreed models
- Transition period
  - The initial period would be managed as a period of transition, during which a programme of milestone actions would ensure that a regime of data gathering would be put in place.
  - A limited number of appropriate targets, input based, would be set for the initial period and specified in physical terms.
- Data review and adjustment process
  - After the initial transition period, new baseline data would be audited by an Independent Expert and agreed by co-contractors.
  - Long-term output based targets would be agreed, following a pre-agreed rules based approach and adjustment model, along with a revised set of contract obligations relating to level of service, investments, and revenue.
  - These contract obligations would be adjusted to maintain an acceptable financial balance within the contract, following a pre-agreed process for periodic adjustment linking tariff with level of service and investment plans. In the event that the tariff cannot be adjusted sufficiently without impacting on wider social acceptability, then alternative adjustment provisions would be considered – including investment profile and target rescheduling.
  - An Independent Expert would audit the compensation process and adjudicate in the event of disagreements over final negotiation.
  - An arbitrator would adjudicate in the event of disputes.
- Performance monitoring
  - A set of appropriate performance measures could be aggregated and used to assess the operator's performance during the transition period, with surrogate indicators in the early years which are progressively replaced as data quality evolves with improvements in data management and reporting.
  - When accurate data sets are established and monitored after a few years of operation, a more sophisticated system can be put in place.

Suggested draft contract provisions to complement the above key recommendations are provided in outline in Annex 8 (Volume 2). The ideas contained within these draft clauses might be used as a basis for further development of such provisions in future transactions.

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