Performance Based Contracts for Reducing Non-Revenue Water:

Selected Lessons from International Experience

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Table of Contents

Acronyms & Abbreviations

ADB	Asian Development Bank
IFC	International Finance Corporation
IWA	International Water Association
NRW	Non-Revenue Water
PBC	Performance-Based Contract
PPP	Public-Private Partnership
WC	Water Conservation
WDM	Water Demand Management

List of Boxes & Figures

Boxes

Figures

Introduction

South Africa, as a semi-arid country, is required to invest heavily in primary and secondary water resources infrastructure to ensure that adequate water is available to satisfy its domestic, commercial and agricultural demand. It is estimated that, of this total demand, the municipal water services sector represents 27%.

"After years of poor maintenance, especially in (South African) municipalities, a crisis is looming as more people run out of water. It will cost more than R600 billion rand to rectify"
(Mail and Guardian, page 17, 20th December 2013)

As the Minister for Water and the Environment made clear in 2013 when launching a study into 'non-revenue water', the sector continues to experience high water losses and leaks attributed to, amongst others, aging water infrastructure, inconsistent metering and billing systems, lack of awareness amongst customers and poor operation and maintenance of water supply systems. She went on to point out that reducing water losses in municipal supply systems is a strategic priority for South Africa's water sector. Not only will it help municipalities meet growing demands, but a reduction in water losses will help to improve municipal finances and also reduce the impacts on the environment.

"One of the major issues affecting water utilities in the developing world is the considerable difference between the amount of water put into the distribution system and the amount of water billed to consumers"
(Kingdom et al, 2006)

As has been recognised in many countries, the savings made in addressing non-revenue water can cover the cost of the needed interventions within a few years. Yet the challenge can be quite technical and the skills to take this on do not always reside within public municipalities. For instance, an Asian Development Bank report looking specifically at NRW reduction in 2010 suggested that the *"design of NRW reduction contracts is not simple, and very few specialists currently have enough experience to properly design such contracts"* (Frauendorfer & Liemberger, 2010). For these and other reasons, there is growing worldwide interest in performance-based contracts (PBCs) with specialised contractors. PBCs can be used to ensure that targeted results – and value for money - are achieved and that critical skills and knowledge can be sourced from outside the municipality itself.

A recognised obstacle to this approach is the complexity of establishing such performance-based contracts. As such, GIZ, the German development aid implementing agent, with funding from the German, British and Australian governments is supporting the Strategic Water Partners Network (SWPN) by contracting a consultant to develop standard contract(s) that comply with South African administrative requirements and which facilitate the routine implementation of water loss reduction activities[1]. Part of the activities undertaken by the consultant have been – via professional networks and published literature – to review international experience on this issue. This short paper presents some of these findings.

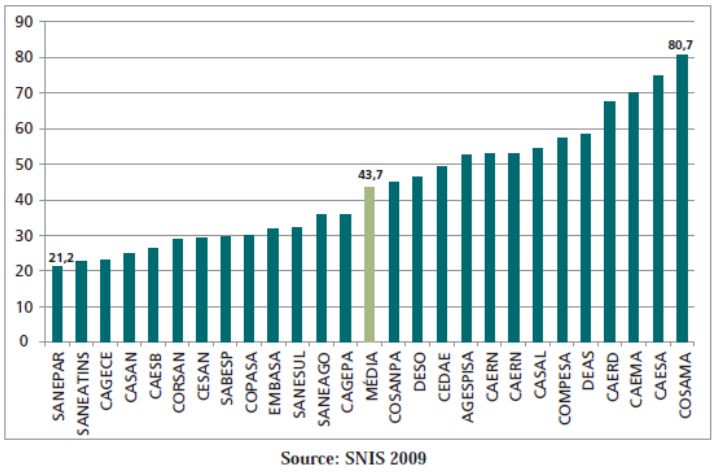
Global experience to date

In recent years there has been growing international interest both in non-revenue water reduction (NRW) and in the use of performance-based contracts to do so - the reasons for this are discussed in the two following sections. Most of this experience has been in either developed or 'emerging' economies (e.g. Brazil, Malaysia), but has also been spreading to developing countries (e.g. Vietnam, Kenya).

[1] SWPN is a grouping of the Department of Water Affairs, National Planning Commission, local government, major private sector organisations and related stakeholder bodies, all with commitment to making an impact on reducing unnecessary water demand.

Partly as a consequence, there is a growing literature base that addresses the topic. One of the early, seminal, works was published by the World Bank in 2006, entitled "The Challenge of Reducing Non-Revenue Water (NRW) in Developing Countries – How the Private Sector Can Help: A Look at Performance-Based Service Contracting". This looked at the rationale for NRW reduction (along with some of the apparent stumbling blocks) and specifically at four cases where performance-based contracts (PBCs) had been used. These cases were in Ireland, Malaysia, Brazil and Thailand. Since then other countries have also put PBCs in place, including Vietnam, where Ho Chi Minh has had a contract running since 2008. The International Water Association has gone as far as setting up a working group specifically to look the implementation of PBCs.

"The current situation regarding water loss and energy efficiency for Brazil's water utility sector is quite problematic. The average water loss in water utility companies in Brazil is approximately 40 percent (including both physical and apparent losses), and in some companies, losses exceed 60 percent ... the high level of water losses reduces companies' revenues, and consequently, their ability to obtain financing and invest in improvements. Additional damages are generated to the environment when water utility companies are forced to seek out new springs or water sources to compensate" (IFC, 2013)



Source: SNIS 2009

Fig 1: NRW figures in Brazil mirror those in South Africa (Source: IFC, 2013)

Brazil is a country of particular interest in this regard – partly as its municipal water utilities show similar levels of NRW to those we have here in South Africa – and partly due to the legislative and other barriers to implementing PBCs.

Indeed the International Finance Corporation (part of the World Bank Group) published in 2013 a *"Manual for Performance-Based Contracting by Water Utility Companies in Brazil"* which is helpful in looking both at how to put in place such a contract but also, crucially, why to do so.

Why Performance-Based Contracts?

Different authors cite various reasons for adopting PBCs, but the Brazilian manual goes into the topic in quite some detail. The authors of the manual cite four principal reasons for considering a PBC over other possible options (for instance addressing NRW in-house or via the relatively simpler outsourcing of certain tasks, such as leak detection).

"It (a PBC) has the potential to bring rapid improvements for a public water utility, in terms of both increased cash flows and more water available to serve the population, by efficiently harnessing the know-how of the private sector" (Frauendorfer & Liemberger, 2010)

Firstly there is the issue of **technical know-how**. Addressing NRW – whether physical or commercial losses – can be technically quite challenging and the expertise on how best to do this does not always lie within municipalities themselves. Private sector companies that specialise in this issue are well placed to bring about efficiencies at lower cost and lower risk than in-house approaches, whilst well-structured contracts can include capacity building elements, such that this knowhow is transferred from the contractor to the water utility over the medium- to long-term.

Secondly there is the benefit, in a well-structured contract, of increasing the **incentives** for private contractors to do a good job (and see those gains sustained over time). PBCs allow contractors to be rewarded when things go well and be punished when they don't – which provides added motivation by harnessing the profit motive in aligning the incentives of the contractor and the municipal service provider.

"Under performance-based service contracting, a private company is contracted by the management of a public utility to carry out a comprehensive NRW reduction program, with sufficient incentives and flexibility to ensure accountability for performance and with payment linked to actual results achieved in NRW reduction"
(Kingdom et al, 2006)

Thirdly there is the opportunity to **reduce the transaction costs** of outsourcing work to an outside party. By having one large contract, which affords the private sector flexibility to decide how to approach the job, the need to issue many small contracts (and go through difficult design and procurement processes each time) is lessened. A well-designed and managed PBC aligns the incentives of each party and also allocates risks to those best able to handle them – and can therefore offer clear advantages over piecemeal awarding of numerous small tenders for specific pieces of work (such as the installation of pressure reduction valves).

Lastly the Brazilian authors cite the **potential financing capacity** as another reason to consider PBCs. Depending on the nature of NRW reduction activities, they can be expensive; *"reducing physical leakages can require significant capital investment"* (Kingdom et al, 2006). Physical works to reorganise networks, install pressure management technology, etcetera, can indeed require significant capital outlays. In Brazil one of the cited advantages, for municipalities, of PBCs is to a) get the private sector to pay up front for this and spread the repayments over time; and b) use the private sector's better credit rating to get access to 'cheaper' money. How this would play out in South Africa, where much infrastructure development is directly or indirectly funded by national Treasury and few municipalities raise money via bond markets, is perhaps more debatable.

Non-Revenue Water reduction

Before considering performance-based contracts further it is worth quickly looking at the international experience with non-revenue water reduction. NRW is a common term used internationally, although here in South Africa, in a municipal policy environment, many of the activities that NRW reduction includes, fall under the term WC-WDM (an acronym that stands for Water Conservation-Water Demand Management). WC-WDM is not necessarily the same thing, in all contexts as "NRW reduction", but there are certainly large overlaps.

Fig 2: Pressure Management Chamber in Cape Town (source, Meyer et al, 2009)

"Outsourcing of certain water loss reduction activities is not a new practice. Many water utilities in Europe, the United States, and even in developing countries ... use private leak detection contractors to periodically survey their distribution network"
(Frauendorfer & Liemberger, 2010)

There are four aspects of global experience worth considering in more detail:

Firstly there is the issue of **incentives**. NRW reduction (and indeed WC-WDM activities) are not noticeably glamorous. Rather than involving the building of new dams or commissioning of new water treatment plants, NRW reduction involves such humdrum activities as replacing washers on taps, identifying and remedying invisible underground leaks and issuing bills to the right addresses. These are not the sort of events that lend themselves to politicians cutting ribbons and holding press conferences and, arguably because of this, getting political support for NRW reduction programmes is a challenge.

"If the reasons for reducing levels of NRW are so compelling, then why hasn't this widespread and generally well-understood challenge already been tackled and defeated? The reason is that reducing NRW is not just a technical issue but also one that goes to the heart of the failings of public water utilities in developing countries", (Kingdom et al, 2006)

Furthermore, NRW reduction is split across two domains within a typical water utility. There are commercial losses, often handled by the billing department and – in South Africa – often by the municipal treasury. This is basically water that is used but not paid for. Then there are physical losses, including actual water leaking out of the system and into the ground or wasted during treatment processes. This is rather the domain of engineering departments and, if the municipality has one, the water and sanitation line department. As Kingdom and his co-authors put it in 2006, *"engineers and operational staff will assure you that the levels relate solely to commercial losses (that is, there is no leakage problem), while the commercial staff will say that it is all leakage"*! Given the ability for NRW to fall between these 'two stools' and the frequent lack of political support for expenditure on remedying it, getting support from within a municipality can be a real challenge.

Secondly the reduction of NRW is **not just a technical challenge**. Tackling commercial losses means getting customers to pay money they owe for water they have consumed. Doing this is not always a political priority and in some countries (where, for instance, the army and police are the two largest debtors), it can be downright dangerous. It can also mean changing the mindset of both customers and staff – to report leaks when they are noticed, or to take such reports seriously. To be serious about saving water – and not just when drought or water restrictions threaten.[2]

Thirdly, having up to date and **accurate baseline information** is vital. If there is no reliable baseline it is hard to know where - amongst the myriad of possibilities – to target. It is even harder to know when you're succeeding or when a change of course is needed. When it comes to PBCs this need for accurate information is even more pronounced given that remuneration is in part dependent on savings made (and therefore current and future losses need to be known). Given that the majority of municipalities in South Africa struggle to deliver an accurate 'water balance' to provincial and national authorities (something they are legally obliged to do) this is a particular challenge.

<table>
<tr><td rowspan="10">Water entering the system (includes imported water)</td><td rowspan="2">Authorised consumption</td><td rowspan="2">Authorised and billed volume</td><td>Measured invoiced volume (includes exported water)</td><td rowspan="2">Invoiced water</td></tr>
<tr><td>Unauthorised invoiced consumption (estimated)</td></tr>
<tr><td rowspan="2">Non-billed authorised consumption</td><td>Non-billed authorised consumption. Non-billed measured consumption (uses per se, water tank trucks, etc.)</td><td rowspan="8">Non-invoiced Water or Non-Revenue Water (NRW)</td></tr>
<tr><td>Non-measured non-billed consumption (firefighting, slums, etc.)</td></tr>
<tr><td rowspan="6">Water losses</td><td rowspan="2">Apparent losses</td><td>Non-authorised use (fraud and registry failures)</td></tr>
<tr><td>Measurement errors (macro- and micro-measurement)</td></tr>
<tr><td rowspan="4">Real losses</td><td>Real losses in raw water piping and in treatment (whenever applicable)</td></tr>
<tr><td>Leaks in pipelines and/or distribution networks</td></tr>
<tr><td>Leaks and spillovers in pipeline reservoirs and/or distribution</td></tr>
<tr><td>Leaks in branch lines (upstream from the point of measurement)</td></tr>
</table>

Fig 3: Distribution of real and apparent water losses as water flows through a water distribution system. Source: Public Private Infrastructure Advisory Facility

[2] Kingdom et al (2006) suggested that, *"not only do new technical approaches have to be adopted, but effective arrangements must be established in the managerial and institutional environment – often requiring attention to some fundamental challenges in the utility".*

Lastly, there are certain **financial considerations**. Many experienced observers stress that the decision to implement an NRW reduction program must be based on a detailed cost-benefit analysis based on the actual situation of the water utility. This is partly as the length of the payback period can vary greatly depending on which assumptions have been made during the design. Furthermore, to be efficient and to garner economies of scale, NRW programs directed at reducing physical leakages must incorporate fairly sizeable budgets for investment and rehabilitation of the water network. This, plus the need for accurate baseline information and ongoing monitoring, suggest that PBCs will be limited to the larger, more sophisticated utilities (perhaps, for instance, the largest 30 to 40 in South Africa).

"Water loss reduction programs require teams and skilled labor, and the transaction costs associated with performance-based projects do not justify projects with less than 10,000 connections" (IFC, 2013)

Box 1: The State of WC-WDM in South Africa

South African experience in the WC-WDM sector dates back to the late 1990s and has been described in a number of Water Research Commission publications. All of South Africa's metropolitan municipalities are engaged in WC-WDM initiatives, but to date performance based contracting is still relatively untried. Three of South Africa's state-of-the-art pressure-management installations are those at Khayelitsha, Mitchell's Plain and Sebokeng. The latter was installed in 2005 entirely at the service provider's cost as part of South Africa's first performance based WC-WDM contract, and resulted in a saving of R150 million in bulk water costs over the subsequent five year period, The service provider was paid R25 million and incurred costs of R15 million. The service provider company therefore made R10 million (over five years) in return for raising and risking R15 million, and in return for its technical expertise. The client municipality saved R125 million.

Putting in place a Performance-Based Contract: Key learning from international experience

Scoping

The first question to address is what scope any PBC will cover – what activities are to be included, where are interventions to take place, how much of the network is going to be addressed?

Box 2: Defining the project coverage area

"The first and likely most important stage in preparing a successful performance contract is defining the project coverage area". Criteria that may help to define the intervention area include:(a) High rates of losses; (b) Water isolation – i.e. an area where increases in available water can be measured effectively; (c) Socio-economic characteristics that represent all other areas served by the water system; (d) A significant number of connections, e.g. an area with at least 10,000 connections is recommended; e) High production costs, or high costs linked to system distribution or expansion; (f) High distribution costs; (g) Economies of scale.

Adapted from IFC, 2013

As can be seen from the above box, the geographical considerations in scope are important. Notable is the minimum size of intervention that the Brazilian manual on PBCs (from whence this text is taken) recommends. Another important consideration (and one can run counter to arguments for a larger project area) is the preference to have an area of 'strong water isolation' – areas where there are few incoming sources of water – or in other words, an area where the water balance can be reliably calculated.

Other experience, addressing the question of geography, warn against 'cherrypicking' – i.e. allowing the contractor to choose areas in which the easiest gains can be made, areas where intervention to reduce NRW may not necessarily match the priorities of the municipality.

"It should be noted that pressure management cannot be used in every area and therefore it is essential to carry out careful planning to determine the financial feasibility of a proposed project and to ensure that the network will be able to accommodate pressure reduction" (Meyer et al, 2009)

The question of the technical scope of any contract is another key issue. At a workshop held in October 2013 to discuss a template PBC for South Africa, there were strong arguments for pressure reduction as one of the first interventions to focus on. Indeed Cape Town Metro have suggested that "*it is clear that pressure management has been a highly effective tool to reduce water leakage in Cape Town. The total savings … (are) approximately R80 million/yr"* (Meyer et al, 2009).

Nevertheless, in Brazil, one of the key recommendations was to look first at commercial losses, particularly those of commercial and industrial customers. A PBC in Sao Paolo got outside contractors to focus on the meters measuring the consumption of the largest commercial and industrial customers in that city (the utility, SABESP, that serves the São Paulo etropolitan Region, is one of the largest public water utilities in the world and supplies a population of 25 million) – the gains that were made by swapping out old meters and focussing on accuracy of readings in the new ones were considerable indeed. Twenty seven thousand meters were replaced, increasing revenues to the tune of US$72 million over a three year period (a quarter of which was paid to the contractors).

"A detailed cost-benefit analysis should always be undertaken early to ensure that any proposed NRW reduction program makes financial sense, given the value of water saved (marginal cost or revenue per cubic meter saved) and the cost of developing alternative production sources." (Kingdom et al, 2006)

In South Africa it may be harder to get political support to focus on commercial losses – whilst the billing and collection function is often outside the remit of the 'water professionals' in the municipality. Hence most of the discussions around NRW reduction in South Africa (and certainly at the October 2013 workshop mentioned above) have focussed on the reduction of physical losses.

"The starting point is to develop a strategy based on a sound baseline assessment of the sources and magnitudes of the NRW ... (considering) ... both the short and long terms ... it is during strategy development that opportunities ... can be identified." (Kingdom et al, 2006)

Risk – reward balance

As a form of Public Private Partnership (PPP), PBCs must be structured in such a way that an appropriate balance is found between risks and rewards. Appropriate and realistic targets need to be set – and the nature and level of risks that a utility seeks to pass to the private sector need due consideration. The more risk that is transferred the higher the price will be. As Kingdom et al (2006) suggested, "*… the challenge will be to find a balance between accountability for end results on one side and a cost-effective level of risk transfer to the private sector on the other side*".

The case studies looked at in the 2006 World Bank document show the importance of considering the full range of incentives (on both sides) when structuring a contract. In Dublin, one of the prime motivations for the contractor doing a good job appears to be reputational – the contract was high profile and the contractor wanted to be seen to have done a good job. In Malaysia one of the motivations was to secure a second stage of contracts. This consideration should apply not only to the private partner but to the public partner too[3].

[3] *"In practice, the applicability of performance-based service contracting to an NRW reduction program depends on the level of risk that the private sector is willing to take, which is itself linked to overall country risk, the specific conditions of the water utility, and the detailed contractual form"* (Kingdom et al, 2006)

Using variable incentives

Various observers, including Frauendorfer & Liemberger in their 2010 guide for the Asian Development Bank, suggest allowing a certain proportion of the payments as fixed fee. The argument is that this will reduce the total cost of the contract, by reducing the overall level of risk being taken by the contractor. They suggest a mix of fixed fee, performance payments, and payments for materials and civil works. Nevertheless, as they indeed caution, this has to be well balanced. One of the apparent drawbacks of the Dublin case study was that the scope of the contract that was included in 'unit cost pass throughs' was too high. This weakened the performance-related incentives for the contractor and may have overly rewarded them for risks 'not taken'.

"Contract models and level of performance based payments can vary widely from one utility to another" (Frauendorfer & Liemberger, 2010)

This issue applies not just to the mix of incentives used, but the targets applied (if indeed targets do form a part-basis for remuneration). For *"… inappropriate targets can constrain the delivery of reduced NRW (the target has been achieved, so why make any more reductions?) in a way that a (true) performance-based service contract would not – for which the more reduction, the greater the payment"* (Kingdom et al, 2006)

Box 3: Performance Contracts versus Target Contracts

"Often, target contracts are confused with performance-based contracts. A target contract is a contract where, for example, NRW has to be reduced by a certain, pre-determined volume and penalties / bonuses apply for not achieving/surpassing the target. These are often problematic, as the targets are frequently arbitrary. If the targets are too high, the private sector will not be interested to bid or the risk premium will be substantial. If they are too low, the contract might be disadvantageous for the utility. True performance contracts have no contractual target and the performance fee is directly proportional to NRW reduction".

Sourced directly from Liemberger et al, 2009

Building in sufficient flexibility

A key admonition is to provide the contractor with the necessary flexibility and resources to carry out the many activities needed to make a meaningful impact on NRW levels. If sufficient flexibility is not left to the private partner then full advantage of their technical know-how is usually not being taken advantage of. A further example is where a lack of flexibility in human resources management could make it difficult to reorganize working shifts and pay bonuses for staff who work at night on leakage detection. The advice is to think carefully about how to bring in expertise and not just for the implementation stage but also for its design of any NRW reduction programme.

The key is to arrive at a just exchange - where, in return for taking risks on the performance of the project, contractors are given the latitude to undertake the needed activities according to their experience and judgment.

"Flexibility to accommodate future modifications of the contract is also an important issue, especially for larger contracts with a long duration. Changes might become necessary in the course of the contract and the contractual provisions should allow modifications" (Frauendorfer & Liemberger, 2010)

Flexibility can however go too far. As mentioned, in Malaysia, the contractor was given the freedom to choose zones anywhere in the network. This, although permitted by the contract, allowed the private contractor to choose zones that did not fully match the priorities of the utility. Equally, latitude on technical considerations may lead a contractor to choosing technologies that cannot be easily sustained once the contract has ended, or realising quick wins at the expense of long-term plans.

The challenge of measuring and monitoring

The need for a reliable baseline has already been stressed. However the data challenge does not stop here – ongoing data collection needs to be up to speed – and managing and acting upon the data being collected is crucial (both during and after any contract). The box below gives some further insights gleaned from an Asian Development Bank manual on NRW reduction.

Box 4: Ensuring sufficient data collection and management

"A lack of understanding of the magnitude and sources of NRW is one of the main reasons for insufficient NRW reduction efforts around the world. This issue has to be addressed when designing a PBC. Only by quantifying NRW and its components and calculating appropriate performance indicators can the NRW situation be properly understood, cost estimates be made, and a fair contract model be developed. It is also of utmost importance to have good pressure and supply time data, as those have a fundamental impact on leakage levels and its reduction/increase potential. The contractor must also have appropriate information systems since, as explained above, NRW management requires collecting a good deal of data. Also, because much of this data is invaluable for the utility over the long term, the contractor must share access to the systems during the contract, and all the systems and data must be handed over at the end of the contract".

Sourced directly from Frauendorfer & Liemberger (2010)

As hinted in Box 4, it is vital to choose the 'right' indicator for measuring performance. This can be doubly complex in a context where water supply is not reliable 24/7. The manual for Brazil suggests four alternatives (from amongst a wider set of options). These include: a) volumes compared to the baseline – with an agreed compensation amount per unit saved; b) a baseline and indicators that measure reduction in operational costs; c) a baseline and indicators based on collections and billing; and d) a combination approach. See pages 28 and 29 in the manual for detailed explanations, including the pros and cons of each.

Procurement & payment considerations

Given the technical nature of the activities needed to reduce NRW and the premium being put on expertise and knowhow, the procurement and selection of the 'right' operator becomes a prime concern. The four cases discussed by Kingdom and his co-authors did not always feature competitive bidding, partly due to the small number of service providers out there that can and want to tackle the contracts, partly because of unsolicited proposals and, in one instance, as the quality of the technical proposal was a major selection criterion with many clauses left for negotiation (although competitively bid, this contract became largely a negotiated one).

Against that, Frauendorfer & Liemberger, in the ADB guide of 2010, recommend that *"ideally, bid evaluation would not only be based on the contract price but also take the quality of the technical proposal into account. This might not always be possible under applicable procurement rules, but at a minimum, there should be a strict prequalification process and pass/fail criteria to ensure that all compliant bidders are capable of successfully undertaking the contract"*. This is especially important to dissuade 'fly-by-night' bidders that could do significant harm if 'let loose' on the water network – where non-payment due to lack of non-performance would be scant compensation.[4]

Of course non-performance is not a matter for only the contractor. There is also the risk that the public partner does not fulfil their commitments, which can be many (including giving permission to dig up streets, not interfering in zones where the contractor is working, not undertaking significant initiatives that may affect performance in ways that cannot be easily measured or attributed, etc). A key responsibility in all circumstances is to pay however – and the fact that the private sector only gets paid *after* performing (and once shown to do so) is a non-negligible risk for them.

[4] Although this fact, that the contractor does not get paid (or is at least financially punished) if they do not perform, is one of the appeals of a PBC approach.

Box 5: Payment risk

"A critical aspect of developing performance contracts in Brazil is public companies' ability to pay the contracted parties. As most public water utility companies have low creditworthiness, private companies that provide water loss reduction … services are hesitant to engage in performance contracts because of the high risk of delinquency. In a performance contract, the contracted party carries out all of the activities and investments before receiving its compensation, whereas in traditional contracts, expenditures and investments are concurrent with service provision. In the event of lack of payment, the contracted party can interrupt services as leverage until payment is made. One alternative to mitigate that risk is to issue, in parallel with the performance contract, a fiduciary assignment of receivables as collateral, linked in an escrow account". Sourced directly from IFC, 2013

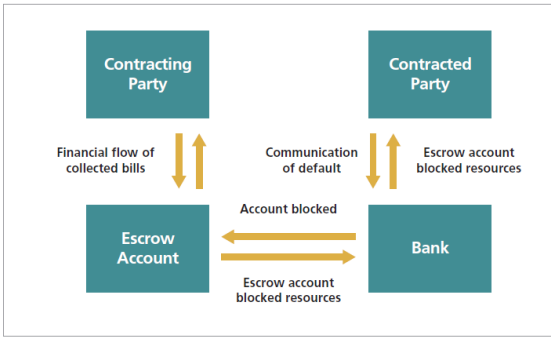


Fig 4: Possible structure of an escrow account (Source: IFC, 2013)

Ensuring sustainability

"Once installed, it is important to monitor the operation of pressure reducing valves and controllers on a regular basis to ensure that all the equipment is operating satisfactorily … staff at the water utility should be trained on the maintenance of pressure reducing valves and on the setting of pressure controllers" (Meyer et al, 2009)

The final recommendation from the global literature and by experienced practitioners is to pay close attention to sustaining any gains made during a PBC. A crucial question to ask therefore is "what are incentives and capacity to sustain the benefits?". These considerations should be at hand during the framing of any contract as activities can be scheduled, within the contract period, that promote sustainability. The box below gives some useful advice from the Asian Development Bank.

Box 6: Planning for beyond the contract

"A utility should consider what will happen after the PBC has been completed. NRW management is not a one-time effort but a never-ending, ongoing activity. For instance, while the contractor under a PBC can remove the backlog of leaks, new leaks will appear afterwards. It is therefore essential that the utility have plans after the PBC expires. If the utility intends to take over NRW management, they must build staff capacity and make all the necessary provisions to enable them to continue in a successful manner. This includes transfer of technology, availability of managerial capacity, sufficient human resources, and long-term budgetary provisions.

Flexibility to accommodate future modifications of the contract is also an important issue, especially for larger contracts with a long duration …. (another) possibility is to continue outsourcing NRW management (or parts of it). This might be done under a subsequent performance contract, but the contractual provision, and the performance assessment and payment mechanism may be substantially different for a contract that only intends to keep NRW at a certain level".

Box directly sourced from Frauendorfer & Liemberger, 2010

Conclusions and reflections

This document has looked at global experience to date in what is a field of growing interest (as indicated by the creation of the IWA working group dealing with PBCs). In 2006, there were few enough examples of PBCs and those were confined to fairly developed economies. Since then, the approach has spread further, reaching Vietnam and Kenya, amongst other places.

There are challenges with implementing performance-based contracts, to be sure – some of these relate to all efforts to reduce non-revenue water, some only to the PBC approach. Though, as urban populations grow and more pressure is put on increasingly scarce water resources, the importance of using more wisely the water we have has gained wider recognition. With this, appreciation of the expertise and knowhow that resides in specialised consultants and contractors has arisen, as well as the undeniable benefits that can be gained by having diverse municipalities harness this.

Key learning points from international experience on PBCs has highlighted the need for careful scoping, for informed design to get the risk – reward balance right and the different ways in which variable incentives can be applied. The need to build in sufficient flexibility has been underlined and the challenge of measuring and monitoring stressed. As with any partnership involving both the public and private sectors, there are serious considerations around both procurement & payment modalities. Given too that PBCs are generally limited in duration the issue of how to transfer the skills and knowhow to the public sector, and to take other measures to ensure sustainability, is an especially crucial one.

Finally, given that the work this documents supports is focussed on the preparation of a draft contract to assist with the adoption of Performance Based Contracts for NRW reduction in South Africa, it seems appropriate to end with two quotes about the contract documents themselves and the preparation and 'management' of this contract (both taken from Frauendorfer & Liemberger's 2010 report on *"The issues and challenges of reducing non-revenue water"* for the Asian Development Bank)

"It is also worth noting that the development of tender documents for PBCs is not an easy task, and public procurement laws in many countries make the development of such contracts very difficult. Thus, water utilities should always consider engaging a specialist advisor to develop the contract and sometimes even to support contract management"

"Contract documents should be well balanced and fair to both parties. There must be a clear delineation between contractor and utility rights and responsibilities. Also, while the contract documents for a PBC must be sufficiently comprehensive, it is advisable to keep things as simple as possible. This applies to the legal language, performance monitoring and measurement mechanism, and reporting and dispute resolution process"

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Annex A: Features of traditional contracts versus performance contracts

The table below provides a comparison between traditional contracts and performance contracts for water loss reduction projects. Five aspects are assessed: (i) implementation investments and expenses; (ii) capital needs; (iii) the contracted party'scompensation; (iv) risk; and (v) technology (IFC, 2013).

Feature	Traditional Contract	Performance Contract
Implementation investments and expenditures	Made by the water utility company	Made by the contracted party
Capital needs	Water utility company must have capital available to invest	Contracted party supplies capital for investments and expenses
Compensation of contracted party	Defined in tender Depends on work completed, not on effective achievement of goals	Depends on performance If contracted party does not achieve goal, it is penalized through lower compensation
Risk	Borne by water utility company	Borne by contracted party
Technology	Company must have know-how to develop necessary actions in detail	Technology can be brought by the contracted party

Fig 5: Features of traditional contracts versus performance contracts (source: IFC, 2013)

Annex B: Benefits and actions to reduce Real and Apparent Losses

Losses	Apparent losses	Real losses
Gains	Revenue growth	Cost reduction Postponement of investments
Benefits	Increase in measured and billed consumption	Lower expenditures on chemical products, energy, and other inputs Water production reduction, serving the same number of people Water supply to more people using the same volume produced
Actions involved	Change of water meters and other meters; elimination of illegal connections All of the savings effectively measured (residential, commercial, and public) Cadastre improvement	Improvement of the network pressure control Improvement of leaks detection Improvement and change of pipelines, connections, valves

Fig 6: Benefits of loss reduction (source: IFC, 2013)

Annex C: Pros and Cons of Four Selected PBCs

Selangor, Malaysia

+ Positive	- Negative
• Demonstration that impressive results can be achieved • Simple but appropriate performance indicator • Clear performance-monitoring procedures	• Negotiated contract, thus Phase 2 not cost-efficient • No true performance contract because of use of fixed target • Scattered zones for physical loss reduction, instead of focusing on one part of the distribution system

Bangkok, Thailand

+ Positive	- Negative
• True performance-based service contracts, with a payment structure based on actual water saved • Good results achieved (at least in two of the three contracts)	• Too much freedom for making major infrastructure investment based on reimbursable payments, with little incentives for cost efficiency • Major mistake in the drafting of the contract (formula for calculating performance, and thus payments)

Sao Paolo, Brazil

+ Positive	- Negative
• Impressive results achieved • Excellent examples for commercial loss-reduction contracts • Appropriate performance indicators • Clear performance-monitoring procedures	• Nothing material

Dublin, Ireland

+ Positive	- Negative
• Volume of physical loss reduction sufficient to end the water crisis and reestablish continuous supply throughout the system in only two years • A robust system for active leakage control established and currently continued by the client	• Missing baseline and an imprecise mechanism to calculate savings • Weak penalty/bonus formula provided limited incentives • Large cost elements reimbursed on a cost-plus basis • Unrealistically high performance target

Source: Kingdom et al, 2006 – direct snapshots