

Improving the Regulation of Water and Sanitation Services

Preliminary Review to Categorize, Describe and Assess Incentive Provisions in Management Contracts

22 February 2006

Prepared for the World Bank

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TABLE OF CONTENTS

Executive Summary	1
1. Introduction.....	6
2. Classification of Management Contracts.....	9
2.1 Scheme for Classification	9
2.1.1 Performance Measures.....	12
2.1.2 Incentive Functions.....	12
2.1.3 Negative Incentives.....	15
2.2 Description of Incentive Mechanisms	15
2.2.1 Amman.....	16
2.2.2 Kampala 1998-2002.....	18
2.2.3 Kathmandu.....	18
2.2.4 Yeravan.....	21
2.2.5 Kampala 2004-06.....	21
2.2.6 Ghana	24
2.2.7 Rwanda	24
2.2.8 Bukhara and Sammarkand	25
2.2.9 Gaza II.....	26
2.2.10 Georgetown.....	26
2.2.11 Armvodokanal.....	27
2.2.12 Kampala 2002-04.....	27
2.2.13 Trinidad and Tobago.....	28
2.3 Comparison of Incentive Intensity.....	28
3. Assessment of Aspects of Performance Incentives	33
3.1 Performance Measures.....	33
3.1.1 Financial Performance Measures.....	33
3.1.2 Technical Performance Measures	36
3.2 Incentive Function Shape.....	38
3.3 Strength of Incentives	39
3.4 Baseline Data	41
3.5 Intertemporal Incentives	43
3.6 Negative Incentives.....	44
4. Conclusions.....	46

List of Tables

Table 1: Management Contracts Reviewed	7
Table 2: Characterisation of Performance Incentives	10
Table 3: Performance Measures Affecting Remuneration or Termination	11
Table 4: Comparison of Incentive Fee as a Percentage of Fixed Fee	29
Table 5: Comparison of Average Incremental Full Achievement Incentive Fees	31

List of Figures

Figure 1: Stylised Examples of Discrete and Continuous Incentive Functions	13
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List of Boxes

Box 1: Management Fee for IDAMC	23
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Executive Summary

This report has been prepared for the World Bank with the objective of categorizing, describing and assessing the different performance incentives that have been used in a selection of thirteen management contracts in the water supply and sanitation (WSS) sector. This information will help refine the scope of a proposed World Bank research project concerning payment and incentive mechanisms for WSS management contracts.

The report has found that performance incentives vary across different contracts in a number of ways: 1. the performance measures used; 2. the shape of incentive functions; 3. the process for determining the intensity of incentives; 4. the use of baseline information; 5. the manner in which incentives are changed over time; 6. the incentives provided against underperformance.

Firstly, all thirteen contracts reviewed remunerate the management contractor (MC) with a combination of a fixed fee and an incentive fee. The incentive fee is determined by performance against predetermined performance measures. The contracts reviewed use a wide variety of performance measures which are broadly either financial or technical. Operating profit, revenue collected, billings and energy efficiency are examples of different financial performance measures used. Water quality, continuity of supply, unaccounted for water, response times to sewer flooding and wastewater effluent quality are examples of technical performance measures used (a full list is provided in Table 3). The report discusses the distortionary effects of different performance measures. For example, it is found that often financial performance measures are unbalanced: giving incentives to increase revenues, but not to contain costs. The report suggests that these unbalanced measures are distortionary and that more balanced incentives should be considered.

Secondly, the report has found that a range of different types of incentive function are used. Three main types are identified, although some contracts use a combination of the three:

1. In some cases the incentive function provides the MC a share of the residual of revenues net of costs (in some cases the share is determined by performance measures).
2. In other cases the incentive function provides the MC a share of revenue.
3. A number of contracts determine the incentive fee as a proportion of a pre-determined maximum bonus, where the proportion is determined using performance measures.

Across these three categories, incentive functions can be distinguished into those that provide continuous incentives over a range of performance, and those that provide discrete incentives for achievement of discrete performance standards. In general the report argues that discrete incentives are more distortionary than continuous ones.

Thirdly, regarding the intensity of incentives, theory suggests that lower noise in performance measures, higher risk tolerance, greater responsiveness of effort to incentives and higher marginal social benefit of effort would all suggest higher optimal intensity of incentives. The report finds that the strength of incentives varies substantially across contracts with the maximum possible incentive fee ranging from 7% to 156% of the fixed fee. Interestingly, in some cases the intensity of incentives is fixed in the request for proposals (RFP) with bidders bidding only on the fixed fee, while in a few cases bidders bid on both fixed and incentive fees. Where incentive fees are determined by bidding, in some cases the incentive fee is weighted more highly in evaluation, as otherwise a risk averse bidder would rationally only bid a very low incentive fee.

Fourthly, the report finds significant variation in the use of baseline-data in the incentive fee calculation. Some contracts do not include baseline data in the calculation, requiring bidders to make their own assessments of baseline performance, and therefore giving the MC the risk that baseline performance is worse than expected. Other contracts relate performance incentives to baseline performance which is determined ex-post, in some cases by an independent expert, thus reducing the risk taken by the MC. However, this approach can lead to ex-post renegotiation

and weakening of incentives. A further approach adopted is for baseline performance to be determined ex-ante by an independent expert.

Fifthly, some of the contracts reviewed ratchet performance incentives over time by making performance incentives in the next time period dependent upon performance in the current time period. In other cases performance incentives are independent of performance in the previous time period. Ratcheting of incentives weakens the motivational effects of performance incentives, particularly where the activities being incentivised require sustained effort.

Sixthly, a number of contracts included incentives against under-performance as well as an incentive fee for good performance. Some contracts used liquidated damages, others used withholdings, while in other cases “deficiency points” were used which could trigger contract termination.

The variety of performance incentives outlined in this report demonstrates that practitioners developing contracts face substantial choices in designing incentives. A number of questions are highlighted in this report which, if answered, would be valuable for practitioners seeking to improve contract design. These questions include:

- How should the strength of incentives be determined?
 - Should both fixed and incentive fees be tendered?
 - If both are tendered, how should the incentive fee be weighted in tender evaluation?
 - Furthermore, if both are tendered, what are the implications of using different forecasts of performance for tender evaluation purposes, and should these forecasts be revealed to bidders?
 - If only the fixed fee is tendered, how should the strength of the incentive fee be determined ex-ante?

- Where the incentive fee is determined by multiple performance measures, how should the weightings of the different performance measures be determined?
- How should performance measures be defined?
 - What risks might be factored out of the incentive function (e.g. water tariffs, electricity tariffs, inflation, exchange rates) and what are the different methods of doing so?
 - How can the distortionary effects of financial performance measures be reduced (e.g. by the inclusion of depreciation in the performance measure)? Do some accounting rules distort performance incentives?
 - What externalities exist and what technical performance measures are best for internalising these? How are these externalities and the resulting performance measures affected by different contexts?
 - In practice, do input based technical performance measures (for example those requiring the production of particular deliverables) restrict the management contractor's flexibility in a detrimental manner?
- How significant are the demotivational effects of ratcheting of performance standards?
- What negative incentives are most appropriate?
 - How can liquidated damages, withholdings and termination thresholds best be determined?
 - What are the different effects of positive and negative incentives upon relationships between employer and management contractor.

Further research, drawing on incentive theory, theory of contracts, and auction theory, as well as information on the performance of existing management contracts for WSS services, will be invaluable to practitioners grappling with these problems in future.

Furthermore research into performance incentives in management contracts may also prove valuable in the design of incentives for performance contracts within the public sector and also in the design of incentives for other types of private sector participation, such as affermage contracts, where incentives, other than simply a claim on the residual, have in some cases been used.

1. Introduction

Management contracts have become an increasingly popular form of private sector participation (PSP) in the water supply and sanitation (WSS) sector. The number of contracts signed increased from 10 between 1995-2000 to 18 between 2001-2004 (Izaguirre and Hunt, 2005). However, there has been considerable diversity in the form of these contracts, and particularly in the form of performance incentives.

In a lease, affermage, concession or divestiture, the operator is the residual claimant. In these cases the operator is required to achieve certain service standards and retains any residual after operation, maintenance and capital investment (in the case of a concession or divestiture) costs have been met. With prices set either in a contract or through a regulatory process, the operator has a relatively strong incentive to improve efficiency. However, in a management contract the residual claimant is typically the public sector. As a result, management contracts have typically incorporated a wide range of performance measures¹, some of which have been used to generate incentives for operators to improve efficiency.

This report has been prepared for the World Bank with the objective of categorizing, describing and assessing the different performance incentives that have been used in a selection of thirteen management contracts. This information will help refine the scope of a proposed World Bank research project concerning payment and incentive mechanisms for management contracts in the WSS sector. The report focuses upon explicit incentives that are incorporated in the remuneration structure or termination clauses of contracts and which rely upon assumptions of rational utility maximising behaviour. The report does not address implicit incentives such as reputational concerns or other motivations for improving service performance. Consideration of the effectiveness of different performance incentives in practice is excluded from the scope of this report, although Hume Smith (2005) evaluates performance of the incentive structures included in three management contracts for Kampala, Uganda.

¹ In a few cases a measure of the residual has been used as a performance measure.

The thirteen management contracts reviewed cover cities in ten different low and middle income countries. The World Bank database contains twenty water management contracts in low and middle income countries between 1990-2003 and a further six reached financial close in 2004 (World Bank, 2005; Hunt, 2005). It has not been possible to obtain copies of all of the contracts on the database, which itself is incomplete, and in some cases final contracts have not been available for confidentiality reasons and so draft contracts, issued with requests for proposals, have been used. However, the contracts reviewed have been sufficient to develop a categorisation of performance incentives that demonstrates considerable diversity and highlights many of the problems grappled with by practitioners in developing incentive mechanisms for management contracts. Where practicable semi-structured interviews have been held with practitioners involved in developing the performance incentives so as to better understand the drivers and constraints which may have caused particular incentive structures to be adopted. In the majority of cases, it was not possible, within the time available, to identify those directly involved, but this is an area which could be valuably pursued further during later stages of research. The contracts reviewed are listed in Table 1.

Table 1: Management Contracts Reviewed

City, Country	Contract Period	Sponsor
Amman, Jordan	1999-2004	Suez / Montgomery Watson / Arabtech Jardeneh
Armvodokanal, Armenia	2004-2008	Saur
Bukhara & Samarkand, Uzbekistan	2004-2008	Stockholm Water Company / Swedish Water Development / InfraMan GmbH
Gaza II, West Bank & Gaza	Not awarded	
Georgetown, Guyana	2002-2007	Severn Trent
Ghana	Currently tendering	
Kampala, Uganda	1998-2001	Gauff
Kampala, Uganda	2002-2004	Suez
Kampala, Uganda	2004-2006	Kampala Water ¹
Kathmandu, Nepal	Currently tendering	
Rwanda	2003-2008	Lahmeyer
Trinidad and Tobago	1995-1999	Severn Trent / Tarmac Construction
Yerevan, Armenia	2000-2004	ACEA

Notes:

1. The ongoing contract in Kampala is an 'internally delegated management contract' within the public sector between NWSC Head Office and Kampala Water (in particular its 10 partners and 16 associate partners).

Following this introduction, a categorisation of performance incentives is presented in Chapter 2, followed by a summary of the incentive mechanisms used in each of the contracts reviewed. The different characteristics of the performance incentives are assessed in Chapter 3, together with recommendations for areas of further investigation. Brief conclusions are presented in Chapter 4.

2. Classification of Management Contracts

An outline scheme for categorisation of performance incentives in management contracts is presented below, followed by summaries of the actual incentive mechanisms used in a selection of thirteen WSS sector management contracts. Finally the intensity of performance incentives is compared between contracts.

2.1 Scheme for Classification

The remuneration structure for the management contractor (MC), in all of the contracts reviewed, includes both a fixed fee and a performance based incentive fee. Below this level of generality considerable diversity exists. In some cases the fixed fee is a lump sum, while in others it is reimbursable based upon actual staff inputs up to a ceiling figure (see Table 2). However, it is in the incentive fee where greatest variation in approaches exists. Contracts use a wide variety of performance measures, and incentive functions. Some contracts provide negative incentives against poor performance, others do not. Some contracts link incentive functions to baseline data which is determined at the start of the contract, others simply specify fixed targets in the request for proposals (RFP). Some contracts fix the intensity of incentives in the RFP, while others require bidders to specify the intensity of incentives.

In the categorisation of performance incentives described below, a performance incentive is taken to be a financial reward (or penalty, which may include termination) for achievement (or failure) against a specified performance measure. The incentive function relates performance measures to the incentive fee. Table 2 summarises the characteristics of the performance incentives of the 13 contracts reviewed.

Table 2: Characterisation of Performance Incentives

	Amman	Armvodokanal	Bukhara & Samarkand	Gaza II	Georgetown	Ghana	Kampala 1998-02	Kampala 2002-04	Kampala 2004-06	Katmandu	Rwanda	Trinidad and Tobago	Yerevan
Fixed Fee													
- Lump sum	•	•	•			•	•	•	•		•	•	•
- Lump sum with liquidated damages or withholdings if inputs not used													
- Reimbursable up to a ceiling				•	•					•			
Incentive Fee													
Share of residual													
- Share of revenue net of costs after depreciation, adjusted by performance measures										C3			
- Share of improvement over previous year of revenue net of costs, before depreciation	C1												
- Share of improvement over baseline projection of revenue net of costs, before depreciation							C1						
Share of revenues													
- Fee for each unit (GWhr electricity or m ³ water) collected													
- Share of arrears collected													
- Share of revenue above a threshold adjusted by performance measures								C1				C1	
- Share of improvement in collection over previous year									C3				
- Share of improvement in collections over previous year, adjusted by performance measures						C1							C3
Share of pre-determined maximum bonus													
- Share determined by technical, revenue and operating cost measures		C2											
- Share determined by technical and revenue measures			D	D	C2			D	C2		D		
- Share determined by technical measures												D	
Use of baseline data													
- Incentive function includes baseline data or some standards determined ex-post	•	•	•		•	•					•	•	•
Process for Determining Strength of Incentives													
- Bidders specified fixed fee	•	•	•	•	•	•	•	•	•	•	•	•	•
- Bidders specified incentive fee	•				•						•	•	
Negative Incentives													
- Withholdings from management fee for failure to undertake/achieve specified basic activities/targets.	•									•			
- Liquidated Damages for failure to undertake required activities or achieve certain basic targets	•			•		•			•		•		
- Termination linked explicitly to a minimum threshold performance against performance measures	•		•		•		•	•	•				•

Notes:

D = Discrete incentive functions comprise discrete payments for achievement of discrete performance standards.

C1 = Continuous incentive function using linear performance incentives.

C2 = Continuous incentive functions using the weighted sum of multiple linear performance incentives.

C3 = Continuous incentive functions which include the weighted product of two or more linear incentives as well as the weighted sum of multiple linear performance incentives.

In some cases the gradient of linear incentives may include discontinuities and may change with time.

Table 3: Performance Measures Affecting Remuneration or Termination

Performance Measures	Management Contract												
	Amman	Armvodokanal	Bukhara & Samarkand	Gaza II	Georgetown	Ghana	Kampala 1998-02	Kampala 2002-04	Kampala 2004-06	Kathmandu	Rwanda	Trinidad and Tobago	Yerevan
FINANCIAL													
Revenue collections net of operating costs and depreciation									IF				
Revenue collections net of operating costs (but not depreciation)	IF	IF					IF	IF	IF				
Revenue collection	LD		IF/T	IF	IF/T	IF/LD	T	IF/T	IF/T		IF		IF/T
Billings							T	T	IF/T				
Energy efficiency			IF/T			IF							IF/T
Chemicals usage						IF							
Conversion of unregistered connections	W		IF/T					T	IF/T				
TECHNICAL													
Management													
Development of policies, plans, programs, procedures, manuals etc.	W/LD		IF/T	LD						W/T			IF/T
Network information systems	LD		IF/T				T			W/T			
Facilities database				LD						W/T			IF/T
Computerised repair database	LD									W/T			
Strategic network model				LD						W/T			
Computerised billing and collection system	LD		IF/T							W/T			
Computerised accounting system	LD						T			W/T			IF/T
Preventative maintenance programme	LD			LD						W/T			
Computerised maintenance management system	W												
Condition surveys	W			LD						W/T			
Provision of security measures				LD									
Establish customer service centre/complaints system	LD			LD									
Response time to customer complaints	LD			LD	IF/T	LD		T	IF/T	T	IF/LD		
Procurement of capital investment programmes				LD						W/T			
Water Service													
Water quality at treatment works	LD					LD		T	IF/T	T			
Quantity of water produced												IF	
Pressure at treatment works						LD							
Continuity of source works operation				IF		LD							
Management of source works and treatment				LD									
Compliance with groundwater constraints	LD			LD									
Water quality in distribution		IF	IF/T	IF				T	IF/T	T		IF	
Continuity of supply (distribution)	LD	IF	IF/T	IF	IF/T					IF/T		IF	IF/T
Continuity of supply (community taps)										IF			
Public sector water consumption						IF							
UFW Reduction	LD		IF/T	IF	IF/T	LD	T	IF/T	IF/T			IF	
Leakage detection surveys	LD												IF/T
Number of breakdowns and repairs	LD												
Response time to leaks and bursts	LD							T	IF/T	T	IF/LD		
Network zoning			IF/T										
Domestic metering	LD/W	IF	IF/T	LD	IF/T			T	IF/T			IF	IF/T
Source metering						LD				W/T			IF/T
Service coverage					IF/T		T	IF/T	IF/T	IF		IF	
Time to provide a service connection				LD							IF/LD		
Rehabilitation of water treatment/storage facilities			IF/T									IF	
Rehabilitation of community taps										IF			
Water distribution main rehabilitation/replacement	LD		IF/T	LD									
Wastewater Service													
Wastewater effluent quality	LD		IF							IF		IF	
Wastewater effluent quantity										IF			
Wastewater pumping station availability					IF/T								
Response time to sewer blockages or flooding	LD			LD				T	IF/T	T			
Response time to wastewater service connection requests				LD									
Timely septic tank emptying				LD									
CCTV inspection of wastewater facilities				LD									

LD Performance measure used to determine Liquidated Damages
W Performance measure used to determine Withholdings
T Performance measure used explicitly for determination of operator termination.

☒ Service not included in management contract.
IF Performance measure used to determine Incentive Fee

2.1.1 Performance Measures

A wide variety of both financial and technical performance measures are used. Financial measures range from the ‘residual’ of revenues net of operating costs (and in some cases also net of depreciation), to measures of energy efficiency or collection efficiency. Technical measures include, for example, continuity of supply² and service coverage³. Often contracts combine both financial and technical performance measures. The performance measures used in the thirteen contracts reviewed are summarised in Table 3.

2.1.2 Incentive Functions

The incentive functions used to determine the incentive fee are separated into three categories in Table 2.

1. ‘*share of residual*’: functions which relate the incentive fee to a share of the ‘residual’.
2. ‘*share of revenue*’: functions which relate the incentive fee to a share of revenue collected.
3. ‘*share of pre-determined maximum bonus*’: functions which relate the incentive fee to a pre-determined maximum bonus - the proportion of the maximum bonus earned by the MC is determined by a variety of performance measures.

Across these three categories, incentive functions can be distinguished into those that provide continuous incentives over a range of performance, and those that provide discrete incentives for achievement of discrete performance standards. Figure 1 illustrates the difference between these two types of incentive function. Examples of discrete incentives include fixed bonuses for achievement of unaccounted for water⁴

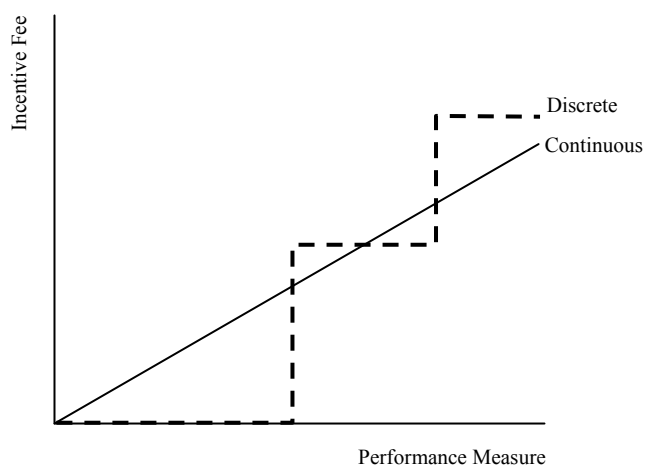
² In many cases water supplies are intermittent and a key service objective is increasing duration, predictability and equity of supply.

³ The proportion of the target population connected to the network.

⁴ Taken, for the purpose of this report, as the proportion of water produced that is not billed.

(UFW) targets, or a series of bonuses for different levels of achievement which result in a stepped incentive function.

Figure 1: Stylised Examples of Discrete and Continuous Incentive Functions



Continuous incentive functions can again be separated into three categories (note the numbering corresponds to that used in Table 2).

- C1 Functions where the incentive fee is simply a proportion of actual performance against performance measures such as revenue collection or the residual. For example in the contract in Kampala between 2002-2004 the MC earned 10% of all arrears collected.
- C2 Functions which use the weighted *sum* of performance against a number of different performance measures. These typically provide continuous incentives over a range of performance (i.e. they include minimum performance standards and target performance standards, with continuous incentives in-between). With these functions performance against one measure does not directly⁵ affect the incentive fee earned from another.

⁵ If the performance measures are correlated then performance against one measure may indirectly affect the incentive fee earned from another measure.

C3. Functions which use the weighted *product* of performance against two or more different performance measures. Most typically these functions include the product of performance against a financial measure (such as collections) and performance against a weighted sum of a basket of other performance measures. In these cases the marginal incentive fee from one performance measure is directly dependant upon progress against other performance measures.

A further dimension along which the incentive function varies is in the use of baseline data (see Table 2). Baseline data comprises information on utility performance against the relevant performance measures prior to the commencement of the management contract. In many cases the quality of baseline data is poor and so this represents a source of uncertainty for tenderers. Two broad approaches are adopted. The first relates incentive payments to improvements over the previous year, or over the base year. In these cases it is necessary to specify the base year performance, or require base year performance to be determined either by one of the parties or by a third party independent expert. The second approach simply specifies performance standards and requires bidders to make their own assessments based upon available information, leaving bidders to take the risk that base year performance was worse than they expected.

Where performance standards are specified (whether continuous or discrete), they can either be independent of previous performance, or they can be dependant upon previous performance (e.g. standards based upon improvement over the previous year). In the former case the MC is able to retain benefits from improved performance over the period of the contract (i.e. ratcheting of standards is weak). In the latter case the MC only benefits from improvement in the year that it is achieved (i.e. there is strong ratcheting of standards).

Contracts also vary in their approach to determining the intensity of performance incentives (see Table 2). In many cases the intensity of incentives is specified in the request for proposals (RFP) leaving bidders to compete on the fixed component. In other cases both the incentive fee and the fixed fee are specified by bidders, and

where this is the case the incentive fee is sometimes given greater weight during evaluation.

2.1.3 *Negative Incentives*

In the majority of cases the incentive fee provides rewards for improved performance, but insures the MC against downside risk⁶. Contracts therefore include a variety of measures that provide the MC with incentives to pursue reform, even if the incentive fee proves elusive in practice. These negative incentives take a variety of forms ranging from pre-determined liquidated damages⁷ and withholdings⁸ to a share of underperformance. All contracts aim to provide incentives to counter poor performance by threatening termination for breach of contract, but in some cases this is formalised through the use of deficiency points and thresholds which trigger termination. Table 2 summarises the different negative incentives used while Table 3 shows the type of performance measures used for withholdings, liquidated damages and deficiency points.

2.2 **Description of Incentive Mechanisms**

The incentive mechanisms for the thirteen contracts reviewed are described in more detail below, together with reasons for selection of particular mechanisms, where information has been available. The contracts are described in three broad categories: firstly those contracts where the incentive fee is primarily based upon a ‘share of residual’; secondly contracts whose incentive fee is based primarily upon a ‘share of revenue’; and thirdly contracts whose incentive fee is based upon a ‘share of pre-determined maximum bonus’.

⁶ If bidders cut the fixed fee bid below cost on the assumption that some costs will be covered by the incentive fee then the extent of insurance against downside risk is reduced.

⁷ ‘Liquidated damages’ are taken as deductions from the fixed fee for failure to achieve a required standard by a specified date.

⁸ ‘Withholdings’ differ from liquidated damages in that if the standard is not achieved payment may be withheld but subsequently released if the standard is achieved at a later date.

2.2.1 Amman

The Amman management contract covered operation, maintenance and rehabilitation of facilities for provision of both water supply and wastewater services. The incentive fee, described in the contract, comprises a percentage of the improvement in financial performance over the previous year. Improvement in financial performance is defined as the change in revenue collected net of change in eligible expenditures. The definition of eligible expenditures does not include depreciation because the lack of a balance sheet, or a detailed valuation of the utility's fixed assets makes incorporating depreciation into the incentive fee problematic (Arthur Andersen, 1997). The percentage of the improvement in financial performance used to calculate the incentive fee was determined as part of the bidding process at 5%.

The tender evaluation ostensibly favoured bidders placing a greater emphasis on the incentive fee as the annual fixed fee was weighted 60% in the evaluation, while the calculated annual incentive fee was weighted only 40%⁹. However, the amount of financial improvement used for calculating the annual incentive fee in the tender evaluation was specified in the RFP and determined through modelling undertaken by Arthur Andersen. This modelling included assumptions, some of which were determined by the government, including: a 10% increase in accounted for water, and 20% increase in collection efforts (Arthur Andersen, 1997). It is possible that bidders saw this determination of the financial improvement, for evaluation purposes, as an over estimate. This would effectively have reduced the bias in the evaluation in favour of the incentive fee component, as bidders might be able to make a profit neutral shift in their bids from the incentive fee to the fixed fee, while at the same time improving their score in the evaluation. This may explain the low proportion of incentive fee included in the winning bid. This conclusion is reinforced by performance in the first two years which showed financial improvement substantially below that assumed for the purpose of tender evaluation (Suleiman, 2002).

The mechanism for calculation of the incentive fee includes provisions to exclude factors beyond the MC's control including: tariff adjustments; electricity costs;

⁹ The successful bidder was the one with the lowest combined score.

chemical costs; and inflation. The mechanism was designed to focus upon three aspects of performance:

1. Revenue optimisation – which captures increased billing, reduced UFW, reduced illegal connections, increased coverage;
2. Collection efficiency – which targets increase cash receipts from billing;
3. Cost control – which ensures that revenue and collections are not pursued at the expense of efficiency.

The calculation of the incentive fee for the first year relies upon base year data determined by Arthur Andersen. In subsequent years data from the immediately preceding year is used to calculate the performance improvement. The reason for this is that the quality of data in the base year is considered to be poor, but assuming that accounting systems are improved, the accuracy of measurements of financial improvement in subsequent years should be improved (Arthur Andersen, 1997).

The contract includes a range of negative incentives which provide incentives to perform even if the incentive fee proves elusive. The contract allows for withholdings from payments to the MC for failure to achieve fourteen performance standards, which principally comprise inputs such as the production of plans, programmes and policies which are readily controllable by the MC. If the performance standards are not achieved by a specified date then a specified sum can be withheld from the management contract. If the standard is subsequently satisfied within 155 days then the withheld amount is paid to the MC, if the standard is not achieved with 155 days, then the withheld amount can be retained as liquidated damages. In addition, the contract includes two other categories of liquidated damages. The first is liquidated damages from the fixed fee for failure to achieve five performance standards associated primarily with basic output standards (for water quality, wastewater effluent quality and compliance with water abstraction constraints). The second is liquidated damages from the incentive fee for failure to achieve a range of deliverables and other output standards.

The MC can be terminated for persistent breach of the performance standards, but also if profits (losses) are less (greater) than those determined for the base year.

2.2.2 *Kampala 1998-2002*

The management contract in Kampala between 1998 and 2002 covered operation and maintenance and billing and revenue collection (NWSC, 1997). The contract includes an incentive fee comprising 25% of the difference between the actual realised 'surplus' (before depreciation and interest payments) and the pre-defined projected 'surplus' without the management contract. The contract allows employer termination if 75% of the targets over four consecutive months are not achieved (see Table 3 for performance measures). The contract was renegotiated during the first year which adjusted the fixed fee and included a requirement for the MC to share 25% of any underperformance below the projected 'surplus' without the management contract.

2.2.3 *Kathmandu*¹⁰

The management contract for Kathmandu has yet to be awarded, but covers both water supply and wastewater services and delegates responsibility for operation, maintenance, as well as planning and management of capital investment (MPPW, 2004). The base component of the incentive fee comprises 40% of the residual after depreciation; however this share increases to up to 80% depending upon performance against performance measures for continuity of supply, water quality, wastewater quality, and expansion of coverage to unconnected poor households. An additional amount equal to 20% of the incentive fee is allocated for staff bonuses. As a result, in the event of full achievement of performance standards, virtually all of the residual is allocated either to the management contractor or utility staff.

Calculation of the incentive fee included a process (using a chained quantity index) for adjusting for any tariff changes that differed from the tariff schedule detailed in the contract.

¹⁰ This section is based in part upon the authors involvement in contract preparation for the performance based management contract in Kathmandu.

The residual was selected as the primary performance measure as it was considered to be a broad indicator which captured both cost and revenue measures. The other performance measures were designed to address externalities not captured by the residual performance measure. The rationale for the inclusion of each is described below:

1. The continuity of supply measure was designed with the intention of increasing the duration, predictability and equality of supply to customers. It was also considered to be a surrogate for providing incentives for UFW reduction. Measurement of UFW was complicated by a lack of source metering and large numbers of non-functioning domestic meters. Given that supplies were intermittent, reducing UFW should increase hours of supply, and so incentives for leakage reduction were captured by the continuity of supply measure. To the extent that UFW reduction results in increased metered water sales then it is also captured by the use of the residual as a performance measure.
2. Water quality is not captured by the residual measure due to limited alternative sources of supply and so was included as a separate measure.
3. Quantity and quality of wastewater collected and treated are both also external to the residual performance measure as the wastewater tariff is linked to water consumption. Much sewage is discharged directly to watercourses and an incentive fee linked purely to the residual provides no incentive to collect and treat this sewage.
4. Increasing connections to unconnected poor households was included in the incentive fee calculation as with an intermittent supply, with largely metered households, additional connections only have a limited effect on revenues, and potentially reduce the average number of hours of supply. As a result the MC would face only weak incentives to increase coverage to poor households if a separate incentive were not included. This performance measure also includes a component which aimed to provide incentives for rehabilitation of, and continuity of supply from, community taps.

The performance standards were designed through financial modelling so that a management contractor performing 'reasonably' would earn an incentive fee of approximately 50% of the fixed fee. This intensity of incentive was based upon a 'gut feeling' of the intensity required to motivate an international utility. Weightings for performance measures were based upon a subjective assessment of their relative importance. Greater weight was given to the residual and continuity of supply (Hughes, 2005). Performance standards were not related to estimates of baseline data due to concerns that this would result in discussion and renegotiation ex-post over data which was in general of poor quality. Bidders were therefore required to make their own assessments, based upon data and reports made available in a data room and on CD ROM.

An upper limit of 100% of the expected fixed fee was placed on the incentive payments. In addition, a minimum full achievement incentive fee of 1/3 the fixed fee is specified which provides an incentive to improve performance against the other performance measures in the event that a positive residual proves elusive.

The MC does not share in any negative residual. Incentives against underperformance are included in the form of withholdings from the management fee for failure to comply with 45 minimum performance standards. The intention was to provide the MC with incentives to improve performance even if the incentive fee proved difficult to achieve. The minimum performance standards comprise a minimum set of activities, deliverables and outcomes that were considered to be readily controllable by the MC and also to be readily achievable by a competent operator. There was concern over limiting the flexibility of the MC and so specification of activities was limited to those deemed to be relatively uncontroversial measures required to improve the management efficiency and performance of the utility.

Further incentives against underperformance were provided by a scheme of deficiency points linked to a set of 58 minimum performance standards. When the cumulative deficiency points over any 12 month period exceed a threshold level then the employer is entitled to terminate.

2.2.4 Yerevan

The Yerevan management contract covers operation, maintenance and rehabilitation of water supply and wastewater facilities (MDPMU, 1999). The maximum incentive fee equals the increase in revenue collections over the previous year, up to a limit of USD 345,000 per annum. This maximum incentive fee is then multiplied by the composite score which is the weighted sum of performance against a range of performance measures (see Table 3). The performance standards for these measures are continuous between maximum and minimum values, and none, except that for energy efficiency, are related to baseline data. The contract requires baseline data to be certified by an ‘independent inspection agency’.

The contract includes a provision for termination of the management contract in the event of failure by the MC to achieve a minimum threshold level on the composite score.

2.2.5 Kampala 2004-06

In 2004, the National Water and Sewerage Corporation (NWSC) entered into an Internally Delegated Area Management Contract (IDAMC) with a partnership of public sector managers, the Kampala Water Partnership (KWP). The IDAMC covers operations and maintenance and management of capital investment for both water supply and wastewater services (NWSC, 2004). The incentive fee calculation is complex and comprises a combination of: discrete incentive payments for achieving collections targets; continuous ‘share of pre-determined maximum bonus’ type incentives for collections, UFW, billings, connections and cash operating margin¹¹; and continuous ‘share of revenue’ type incentives above an upper threshold for collections. The incentive structure is described in more detail in Box 1.

The billing, cash operating margin (COM), UFW and new connection performance measures were selected as they were considered to capture the key priorities of NWSC. Collections were included as a target as they could be easily measured and used as a basis for monthly performance pay for employees, which allowed

¹¹ Collections net of operating expenditures (before depreciation, interest and tax).

employees to see immediate benefits from performance improvement. Billings were included because collections are problematic, due to widespread perceptions that water should be provided free of charge, and so incentives were included for performance improvement even if collections proved elusive. COM was included to provide an incentive for cost containment, but overall the allocated weighting was low due to concern that management might squeeze maintenance costs for the short term benefit of COM, but at the cost of long term serviceability of assets. Depreciation was not included in the COM measure as KWP was not responsible for major capital works and it was felt that the measure should reflect those functions controlled by the MC. Connections were included because coverage is still relatively low at 65% of the target population and some areas continue to receive intermittent supplies. With intermittent supplies the marginal increase in COM or collections from increased connections is reduced. UFW was included as a measure because it is considered a key priority by NWSC, but no assessment of the economic level of leakage has been undertaken (Mwaga, 2005).

The minimum performance standards are the average of performance over the six months prior to commencement. The target performance standards are the standards that were proposed for the third year of the 2002-2004 management contract with Suez¹². Performance standards were determined by setting 'parent objectives' for new connections, UFW and collection efficiency and then modelling levels of other standards that are compatible with these objectives. Weightings for performance standards were based upon perceived priorities. The combination of discrete and continuous incentives in the performance standards resulted from historical incentive pay structures under the Suez contract and this has since been amended for the second year of the IDAMC to give continuous linear incentive functions for performance above the minimum performance standard (Mwaga, 2005).

Although competitions have been held for award of IDAMCs outside the capital, the IDAMC in Kampala was negotiated with the existing management. The intensity of

¹² A decision was made in 2004 not to extend the Suez contract into the third year.

the full achievement incentive fee was established at a level that would provide employee performance payments that doubled basic pay.

Box 1: Management Fee for IDAMC

Management Fee = Base Fee + Performance Fee + Incentive Fee

Base Fee = Base Cost + 75% Performance Related Cost

Performance Related Cost includes Partner and Associate Partner salaries and some other administrative costs

Base Cost includes Seconded Employee costs and most costs associated with operating and maintaining infrastructure

Performance Fee = 25% Performance Related Cost * weighted percentage achievement of 25 Minimum Performance Standards

Monthly Incentive Fee (applies to first two months of a quarter)

If: Ushs 1.8 billion \leq Coll_a \leq Ushs 2 billion per month

$$\text{Monthly Incentive Fee A} = \text{Ushs 30 million} + \text{Ushs 20 million} * (\text{Coll}_a - \text{Ushs 1.8 billion}) / (\text{2.0 billion} - \text{2 billion})$$

If: Ushs 2 billion < Coll_a \leq Ushs 2.125 billion per month

$$\text{Monthly Incentive Fee B} = \text{Ushs 50 million} + \text{Ushs 40 million} * (\text{Coll}_a - \text{Ushs 2.0 billion}) / (\text{2.125 billion} - \text{2 billion})$$

Quarterly Incentive Fee (applies to last month of a quarter)

If: Ushs 5.4 billion \leq Coll_a \leq Ushs 6.0 billion per quarter

$$\text{Quarterly Incentive Fee} = \text{Monthly Incentive Fee A} + \text{Ushs 30 million} * (0.3 \text{ UFW}_a + 0.2 \text{ Bill}_a + 0.3 \text{ COM}_a + 0.2 \text{ CE}_a)$$

If: Ushs 6.0 billion < Coll_a \leq Ushs 6.375 billion per quarter

$$\text{Quarterly Incentive Fee} = \text{Monthly Incentive Fee B} + \text{Ushs 120 million} * (0.3 \text{ UFW}_a + 0.2 \text{ Bill}_a + 0.3 \text{ COM}_a + 0.2 \text{ CE}_a)$$

Annual Incentive Fee

If: annual collections \geq Ushs 25.5 billion

$$\text{Annual Incentive Fee} = 40\% * (\text{Annual Collections} - \text{Ushs 25.5 billion}) * (0.6 + 0.15 \text{ UFW}_a + 0.05 \text{ Bill}_a + 0.15 \text{ COM}_a + 0.05 \text{ CE}_a)$$

Where:

Coll_a = actual monthly collections

UFW_a = (Minimum UFW target – Achieved UFW) / (Minimum UFW Target – Target UFW)

Bill_a = (Achieved Billing Target – Minimum Billing) / (Billing Target – Minimum Billing)

COM_a = (Achieved Cash Operating Margin – Minimum Cash Operating Margin) / (Target Cash Operating Margin – Minimum Cash Operating Margin)

CE_a = (Achieved Connection Efficiency – Minimum Connection Efficiency) / (Connection Efficiency Target – Minimum Connection Efficiency)

Source: (NWSC, 2004).

Performance incentives are provided against underperformance through a set of 25 minimum performance standards, which, if not achieved, result in a reduction of up to 25% in the proportion of certain ‘performance related costs’ that are reimbursed to KWP by NWSC. As ‘performance related costs’ include the basic salaries of KWP partners, failure to achieve the minimum performance standards places a proportion of partners’ basic pay at risk.

The IDAMC also allows termination by NWSC for failure to achieve two or more performance standards for a consecutive six month period, or failure to achieve the minimum standards for any consecutive three month period.

2.2.6 Ghana

The proposed management contract for Ghana covers water supply services only (GWC, 2005). An incentive fee is included which comprises a share of 8% of any reduction in accounts receivable over the previous year. The contract allows for incentive fees for chemical costs, power costs and public sector water consumption, but these fees are to be agreed in the first year of the contract. Liquidated damages are defined for: failures in pressure and quality at the headworks; quality failures in the distribution network; failure to maintain output from treatment works; failure to achieve customer enquiry response times; and failure to achieve customer accounts receivable times. Liquidated damages are proposed for NRW but damages are to be negotiated in the first year of the contract after a plan for NRW reduction has been prepared by the MC.

2.2.7 Rwanda

The management contract for Rwanda covers both water supply and electricity sectors with responsibilities including operation and maintenance of the facilities and planning and management of capital investment (Tremolet, 2004). The incentive fee includes two components: firstly an incentive fee based upon collections which was bid as part of the tendering process: and secondly a bonus/malus which adjusts the management fee by -10%, -5%, 0%, 5% or 10% depending upon whether 0, 1, 2, 3 or 4 discrete performance standards are achieved. These performance standards cover the time to provide connections and the time to repair faults for both water and electricity.

Collections were selected as the primary performance measure as it was deemed to create incentives for the reduction of both UFW and collection efficiency. Other performance measures such as operating costs, staff productivity and numbers of new connections are defined in the contract but not linked to remuneration. The lack of a cost accounting system prevented monitoring of the operating cost measure.

Baseline data was specified in the contract, together with a baseline data review by the MC three months after commencement, although performance standards were not explicitly linked to the baseline data. The baseline review has resulted in a protracted process of negotiation over performance standards which continues two years into the contract.

The RFP required bidders to specify both the fixed fee and the incentive fee (per unit of collections). It was initially envisaged that the evaluation of financial bids would give greater weight to the incentive fee, however, in practice this was not adopted and the fixed and incentive fees were given equal weight.

2.2.8 Bukhara and Sammarkand

The management contract for Bukhara and Sammarkand in Uzbekistan covers operation and maintenance of water supply facilities as well as management of rehabilitation. The incentive fee is calculated as a proportion (determined by the composite score) of the pre-determined maximum annual incentive payment which is split evenly between Bukhara and Samarkand. The maximum annual incentive payment is constant over the four years of the contract and amounts disallowed in one year are not carried forward to the next. The composite score is calculated using a range of weighted criterion values which are in turn determined by evaluation of the respective performance measures against performance standards (see Table 3 for performance measures). The weights and performance standards change annually. The performance standards are discrete, with the criterion values (which together combine to give the composite score) for each performance measure able to take one of eight values.

Many performance standards specify levels of performance to be achieved (e.g. 22 MI/d reduction in UFW), but some relate standards to values in the base year (e.g. 4%

reduction in electricity consumption below base year value). Base year data is established in the base year data report which is prepared by the MC in the first 90 days of the contract and submitted to the independent auditor for review and approval.

The contract includes a provision for termination of the management contract in the event of failure by the MC to achieve a minimum threshold level on the composite score.

2.2.9 Gaza II

The Gaza II contract proposed operation and maintenance of the facilities and planning and management of capital investment for both water and wastewater services. The incentive fee calculation is similar to that for Bukhara and Samarkand, again using discrete performance standards, with criterion values taking one of eight values. The performance standards were specified ex-ante and are different for each year, but they are not dependant upon baseline data. As a result a baseline survey is not required to calculate the incentive fee.

The contract includes liquidated damages at a flat rate of USD 5,000 per occurrence for a range of performance measures (summarised in Table 2) up to a limit of 20% of the MC's payments.

2.2.10 Georgetown

The Georgetown management contract again covers both water and wastewater services and includes operations, maintenance and management of investment programmes. An important feature of the contract is that both the fixed fee and incentive fee were specified by the tenderers in the bidding process. In general the incentive fee calculation is similar to that for Gaza II and Bukhara and Samarkand, except that it appears that interpolation between criterion values is possible, making the incentive function continuous (although in some cases of uneven gradient) rather than discrete. The weights and performance standards change annually. The performance standards for collection efficiency, NRW, metering and continuity of service are related to benchmarks which are to be determined by the MC during the first 12 months of the contract and reported in the base year data report. Other

performance standards for disposal efficiency and customer complaints refer to specific values.

The contract includes a provision for termination of the management contract in the event of failure by the MC to achieve a minimum threshold level on the composite score.

2.2.11 Armvodokanal

The Armvodokanal management contract covers operation, maintenance and management of investment programmes for both water and wastewater services in a number of cities in Armenia. The incentive fee is calculated as a proportion (determined by the composite score) of the pre-determined maximum annual incentive payment, which itself increases annually. The composite score uses weighted performance measures for continuity of supply, water quality, meter coverage and working ratio. Performance standards are set which become more onerous each year with the objective after 6 years of achieving 24 hour supply, 100% compliance against the faecal coliform standard, 85% of subscribers metered, and a working ratio of 100%. The composite score is calculated based upon the percentage achievement of the performance standard over the baseline value for the performance measure. As a result the incentive function is continuous between the baseline and the performance standard. Baseline data is determined by the independent auditor specified in the contract.

Although the MC's responsibilities included wastewater collection and treatment, no performance measures were included for these services.

2.2.12 Kampala 2002-04

The 2002-2004 contract in Kampala covers both water supply and wastewater services and gives responsibility to the MC for operations, maintenance and management of capital investment. The incentive fee comprises discrete performance standards for UFW, non-government revenue collections, and connection efficiency which if achieved trigger lump sum incentive payments at the end of each year. These performance incentives are not reliant upon baseline data. In addition the MC earns 10% of arrears collected. The contract also includes 17 other targets which are

not used to determine the incentive fee but could trigger termination of the contract. Termination can be triggered for failure to achieve the collection target for any consecutive three months, or failure to achieve all of the other targets on average for any consecutive six months period.

2.2.13 Trinidad and Tobago

The management contract for Trinidad and Tobago covered operation, maintenance and management of capital investment for both water supply and wastewater services. The incentive fee component was specified by bidders during the tendering process and was given greater weight than the fixed fee during the evaluation (Nankani, 1997). However, the incentive mechanism and performance measures were not defined at the request for proposals stage and were to be agreed after the commencement of the contract (Virjee and Gaskin, 2003). The performance measures agreed included coverage, continuity of supply, metering, wastewater effluent quality, water production capacity, water quality, UFW and reservoir cleaning. Performance standards were associated with each measure and specified quarterly incentive payments were made if the standards were achieved by specified deadlines (World Bank, 2004).

2.3 Comparison of Incentive Intensity

Tables 2 and 3 provide comparisons of the types of performance incentives and performance measures used in a selection of contracts. This section compares the intensity of performance incentives between contracts. The most straightforward comparison is the balance between the fixed fee and the incentive fee. Table 4 provides estimates of the maximum and actual incentive fees as a percentage of the fixed fees for contracts where this information has been made available. Comparison of the actual percentage incentive fee is clearly problematic as it will depend upon actual performance, which will clearly vary between contracts. Comparison of the maximum percentage incentive fee also takes no account of how achievable the maximum is or of variation in the risk allocation between projects.

Table 4: Comparison of Incentive Fee as a Percentage of Fixed Fee

Management Contract	Incentive Fee Proportion Determined by	Incentive Fee as % of Fixed Fee	
		Actual	Maximum
Amman ¹	Bidders	9%	None
Armvodokanal	RFP		
Bukhara & Samarkand	RFP		
Gaza II	RFP		
Georgetown ⁶	Bidders		8%
Ghana	RFP		
Kampala 1998-02	RFP		None
Kampala 2002-04 ²	RFP	4%	7%
Kampala 2004-06 ⁷	RFP		100%
Kathmandu ³	RFP		100%
Rwanda ⁴	Bidders		20%
Trinidad and Tobago ⁵	Bidders		156%
Yerevan	RFP		

Notes:

1. Actual incentive fee estimated from estimated incentive payment for years 1 to 3 before deduction of withholdings and liquidated damages (Suleiman, 2002). Exchange rate of JOD 0.7 = USD 1 assumed.
2. Incentive fee as described in original contract, prior to renegotiation in year 1 (NWSC, 2002). Exchange rate of US\$ 1730 = USD 1 assumed. Actual figure assumes collection and connection targets achieved, but not UFW.
3. Bids have yet to be returned for the Kathmandu contracts and so the fixed fee has been taken as the 'reference costs' described in the contract (MPPW, 2004). Exchange rate of NPR 1 = USD 0.015 assumed.
4. Based upon maximum bonus and achievement of originally projected variable payments for water and electricity collections (Tremolet, 2004). If these projections are exceeded then a higher incentive fee would be possible.
5. Based upon business plan submitted as part of bid, but before determination of detailed measures (Virjee and Gaskin, 2003).
6. Both bidders specified a maximum incentive compensation of 2% of the fixed fee, however the final figure of 8% was agreed during negotiations with the preferred bidder (Smith, 2005).
7. Although an internal contract the incentive fee for the IDAMC was designed to provide a maximum bonus payment equal to 100% of basic salary for all KWP staff. Basic salary can be thought of as equivalent to the fixed fee component in a conventional management contract.

Nevertheless, the table makes it clear that there is huge variation in the balance between fixed and incentive fees. Where the balance is determined by bidders during the tendering process it is possible that part of the variation results from differing tender evaluation rules with regard to the relative weightings of the fixed and incentive components. If they are given equal weight, then a risk averse bidder would minimise the management fee tendered by bidding only on the fixed fee and so

eliminating the risk premium associated with the incentive fee¹³. This raises moral hazard problems and so in the Trinidad and Tobago and Amman contracts greater weight was given to the incentive fee in the evaluation of proposals. However, in the RFP for the Trinidad and Tobago contract performance measures and standards were not defined, giving bidders the opportunity to negotiate favourable performance incentives ex-post. These factors may explain the high emphasis on the incentive fee in the Trinidad contract. Interestingly the same bidder (Severn Trent Water International) bid a much lower incentive fee in the subsequent Georgetown contract, although the tender evaluation procedure specified in the RFP for this contract is not known to the author.

A further approach for comparing incentive intensity between contracts might be to compare the marginal incentive fee for the same performance measure across different contracts (e.g. the marginal fee for each unit of additional revenue collected or each unit of UFW that is accounted for). In practice however this approach faces a number of problems:

1. Where incentive functions are discrete or include steps the concept of the marginal incentive fee becomes less valuable for comparisons as it is very large at the point of the step and small at other levels of performance.
2. Where incentive functions include the product of multiple performance incentives then the marginal intensity will be a function of other performance measures making comparison difficult.
3. Often performance standards are expressed in percentages or ratios (e.g. UFW, working ratio, or collection efficiency), however without information on actual quantities (e.g. m³/day water accounted for, additional revenue collected, operating cost reductions) it is not possible to make useful comparisons of marginal incentives between contracts. In many cases the necessary information to make these calculations has not been forthcoming.

¹³ Assuming that the bidder's expectation of performance, used for calculation of the incentive fee, is the same as the level of performance assumed for evaluation purposes.

The first of these problems can be overcome by comparing the Average Incremental Full Achievement Incentive Fee (AIFAIF). This is calculated as the total incentive fee for full achievement of a given performance standard, divided by the magnitude of the improvement in the performance measure required for full achievement. The AIFAIF has been calculated for the two most recent management contracts in Kampala for the UFW, collections and service coverage measures. The AIFAIF has also been calculated for UFW for the Bukhara and Samarkand contract (see Table 5). Calculation in most other cases was prevented either by the problems outlined above, incompatible performance measures, or lack of information. The AIFAIF has only been calculated for the first year of the contracts to avoid problems associated with different approaches to ratcheting of performance incentives.

Table 5: Comparison of Average Incremental Full Achievement Incentive Fees

Management Contract	Year 1
Unaccounted for Water (USD/additional m³ accounted for)	
Bukhara	0.007
Samarkand	0.005
Kampala (2002-2004)	0.050
Kampala (2004-2006)	0.039
Revenue Collection (USD/additional USD collected)	
Kampala (2002-2004)	0.067
Kampala (2004-2006)	2.255
Service Coverage (USD/additional active connection)	
Kampala (2002-2004)	1.782
Kampala (2004-2006)	0.881

Table 5 illustrates considerable variation in the AIFAIF, including between two management contracts in the same city, Kampala. Interestingly, the AIFAIF for the current contract in Kampala suggests that the incentive fee for additional collections is more than twice the value of those additional collections. The perverse result is that the cost of additional revenue collection, inevitably exceeds the benefits.

There are a number of possible explanations for the variation in the intensity of incentives described above. Theory of incentive contracts suggests that the optimal intensity of incentives will depend upon (Milgrom and Roberts, 1992):

1. the noise that exists in performance measures (either due to inaccuracy in measurement or exogenous risks);
2. the risk tolerance of the parties;
3. the extent to which incentives induce additional effort - which is linked to the opportunity cost of additional effort;
4. the extent to which additional effort has a marginal social benefit.

Other things being equal, lower noise in performance measures, higher risk tolerance, greater responsiveness of effort to incentives, and greater marginal social benefit of effort all suggest a higher optimal intensity of incentives.

It is possible that variations in intensity result from variations in the above factors. However it is also likely that variation results, at least in part, from errors in determining the optimal intensity of incentives *ex-ante*, particularly as the four factors listed above are difficult to determine with any certainty.

It is also possible that shortcomings in the models developed by incentive theory account for the problems reconciling the predictions of incentive theory with actual contracts in practice. Prendergast (1999) notes that there is mixed evidence for the trade-off between incentives and insurance, and even where the effects of the trade-off are present, there may be considerable variance in observed contracts that is unexplained.

3. Assessment of Aspects of Performance Incentives

This section explores in more detail the pros and cons of different aspects of performance incentives identified in the categorisation outlined above. Particular consideration is given to: the different performance measures used; the shape of the incentive function; different approaches for setting the intensity of incentives and the weighting of multiple performance measures; the use of baseline data; and different approaches to the ratcheting of incentives. In each case the advantages and disadvantages of different approaches are considered and suggestions for further enquiry are identified (the latter shown in *bold italics*).

3.1 Performance Measures

Assuming a more risk averse agent than principal, theory suggests that performance measures should target broad measures of the principals objectives, they should capture the unobserved activity requiring monitoring (e.g. effort), but should not pass to the agent excessive risks that are beyond its control (Sappington, 1994).

In practice, Table 3 illustrates that a wide variety of performance measures are used in management contracts, some of which are broad measures, while others are narrow. This section compares the advantages and disadvantages of using broadly based as well as narrow performance measures for assessing both financial and technical performance.

3.1.1 Financial Performance Measures

The broadest financial performance measure used in the 13 contracts considered was the measure of the 'residual' used in the Kathmandu contract which covers collections, net of operating costs and depreciation. A key advantage of using a broad measure such as the residual, is that it encompasses a wide variety of other financial measures, such as revenue collection, billings and cost containment. At the same time, it forces the management contractor (MC) to make tradeoffs between, say, revenue collection and cost containment. By reducing the number of performance measures required it also reduces the problem of determining ex-ante the appropriate weightings and standards for a large number of performance measures, while at the same time reducing the ex-post monitoring problem.

A problem with broad based financial measures such as the residual, is that it is often necessary to include adjustments to the performance measure to mitigate variations that are beyond the control of the MC. Examples identified in the contracts reviewed include water tariffs, electricity tariffs, inflation, exchange rates. *A review of the different risks that are factored out of the incentive function, and the different methods of doing so (e.g. the chained quantity index used for tariff adjustment in the Kathmandu contract), would be valuable for practitioners developing future management contracts.*

The use of broad based financial performance measures can be obstructed by a lack of systems to calculate performance measures. In Rwanda, the lack of a cost accounting system prevented measurement of operating costs. In Amman, the lack of a detailed valuation of the utility's fixed assets made incorporating depreciation into the performance measure problematic. These problems might be overcome by requiring the MC to develop these systems at the start of contracts.

Broad based financial performance measures are, however the exception, not the norm in the contracts reviewed. The performance measures for all thirteen contracts included revenue collection in some way, five captured operating costs in the performance measure, while only one included depreciation. One argument against including depreciation in the performance measures for the Kampala 2004-2006 contract was that the management contractor did not have control over major investment projects. However, the MC potentially stands to gain windfall incentive payments where capital investment results in improvements against performance measures¹⁴. Also, in many cases the MC is in part responsible for preparing investment plans (although they may be approved by an asset owner) and managing the investment programme. In these cases, if depreciation is excluded from the performance measure, the MC may be able to distort investment programmes to increase incentive payments by substituting capital intensive solutions for ones which are intensive in operating or maintenance costs.

¹⁴ Although if a credible commitment to undertake these investments is provided at the tender stage then these windfall gains should be competed away.

One reason for the limited role of cost containment in performance measures was identified through discussions regarding the design of the Kampala 2004-2006 contract. In this case there were concerns that management would squeeze costs to increase short term profits, but to the detriment of long term profitability and serviceability. For example, extra effort for leakage reduction through network maintenance might be economical in the long term when the cost of water saved outweighs the cost of maintenance work. But if the management contractor has only a short time horizon then the returns from leakage reduction over that period may be insufficient to cover the costs of maintenance work. This example, highlights a time inconsistency problem that arises particularly when contract periods are short. This particular concern might be addressed by reviewing the accounting treatment of maintenance costs for the purposes of calculating the incentive fee. If such maintenance were depreciated over the remaining life of the relevant asset then the time inconsistency problem would be reduced.

A further practical problem of using performance measures based upon a measure of the residual is that in some cases water utilities are not profitable (even before depreciation and debt service) and government is either unwilling to raise tariffs to cover costs, or affordability concerns require that services be subsidised. One solution is to base the incentive fee on *changes* in the profit/loss as in Amman. In addition, where tariffs are below marginal cost, a focus purely on the residual may distort outcomes as firms may be reluctant to expand coverage and leakage reduction efforts may be below the economic level. Accounting depreciation rates may also not reflect true asset lives. A further concern in the use of accounting profit is the scope for distortion through gaming in the accounting of, say, arrears and bad debt provisions. However once these problems are recognised they can be addressed in developing balanced performance measures and audit procedures. In some cases it may still, however, be politically difficult for a publicly owned utility to be seen to earn significant profits from a service which is essential to all.

Although there are problems using broad performance measures such as the residual, there are also problems associated with concentrating upon narrow performance incentives. The principal concern is that important measures of performance are often excluded. A common example is the use of revenue collection as a performance

measure, but without a complementary measure for cost containment. This generates perverse incentives as the MC has incentives to increase collections, even beyond the point where the marginal cost of additional collections exceeds the marginal revenue collected.

Ultimately the distortionary effect of performance incentives is reduced by financial performance measures which combine revenue collections, operating costs and depreciation of assets. *Further consideration would be useful of the potential distortionary effect of accounting rules on performance incentives: for example in time inconsistency problems regarding maintenance or in the compatibility of depreciation rules and asset lives.*

3.1.2 Technical Performance Measures

The technical performance measures listed in Table 3 comprise a combination of service quality measures (e.g. UFW, continuity of supply, water quality, response times to customer complaints) and deliverables (e.g. development of policies and procedures, network information systems, accounting systems, metering of source works, water mains replacement).

Service quality measures are valuable where they cover areas of performance which are external to performance incentives based upon financial performance measures (i.e. where the cost or benefit arising from an activity does not accrue to the MC). There are a wide range of such externalities including services for unprofitable customers, water efficiency (if tariffs are below the opportunity cost of water), expenditure improving water quality or wastewater effluent quality, and expenditure alleviating sewer flooding. In some cases a technical performance measure may be internal to the financial performance measures in one context, but an externality in another. For example, if tariffs and connection fees cover costs in all cases and there are adequate water resources then increasing network coverage is not an externality and performance incentives for increasing coverage are unnecessary. If on the other hand tariffs are below marginal cost, water supplies are intermittent, or costs of supply to some groups of customers are more than others (and these costs are not recoverable) then network coverage is, at least to some degree, an externality and increasing coverage might result in a net reduction in surplus. In these circumstances

separate performance measures may be required if increasing coverage is considered a priority.

Similarly performance measures for leakage reduction may be appropriate where there is water scarcity and tariffs are below the Long Run Marginal Cost (LRMC) of water. Where tariffs are below LRMC then the marginal revenue from leakage reduction activities is below the LRMC of water supplied. Leakage reduction activity will stop at the point where the marginal cost of leakage reduction exceeds the marginal revenue, but this will be below the economic level of leakage¹⁵. Performance measures for UFW reduction may therefore be required to create incentives for the economic level of leakage to be achieved. In addition, if domestic metering is low, marginal increases in water supplied as a result of reduced leakage will have only a limited impact on revenues. In this case then measures of revenue collection would provide weaker incentive for UFW reduction than if all customers were billed on the basis of meter readings. Also important is the accounting treatment of leakage reduction activities. If the costs of these activities are included in the financial performance measures that determine MC remuneration, but the cost of new resource development is not included, then the MC may face perverse incentives that favour new resource development instead of leakage reduction.

A more comprehensive review and analysis of the nature of the externalities that exist in different contexts for different financial performance measures, is likely to provide a valuable starting point for selecting and defining technical performance measures in practice.

The technical performance measures used also often contain significant variation in their specification. For example, the performance measures for continuity of supply in some contracts are specified in detail and cover issues such as sampling method (e.g. pressure monitoring), locations, frequency, sample selection, differentiation between day and night supply, differentiation between supply according to a published schedule and unscheduled supply.

¹⁵ The level of leakage beyond which the cost of leakage reduction activities exceed the long run marginal cost of water.

A review and analysis of the different specifications for key technical performance measures between different contracts would again provide a valuable starting point for practitioners developing performance measures for particular contexts.

Service quality measures generally leave the MC to determine the best approach to improve performance against the measure. This avoids the problem of specifying ex-ante the activities which the MC is required to undertake. A problem which, given bounded rationality, becomes more difficult the longer the contract period. A number of management contracts do, however, link performance incentives to specific deliverables. In general these deliverables cover activities which are readily controllable and achievable by a competent MC. For example a number of contracts require provision of a range of policies, plans, procedures, manuals and programmes to be provided. These are in some cases required to be submitted for approval, but in other cases they are submitted only for comment, so as to mitigate the risk of unreasonable refusal to grant approval. Another important category of deliverables comprises management systems such as accounting, billing, network information and customer services information systems. Contracts including requirements for specific deliverables are pre-judging what deliverables the MC may consider to be necessary for achieving the wider financial and service quality objectives. Provided that the deliverables specified are generally considered to be essential and uncontroversial, then there is little loss of flexibility by specifying them as performance measures ex-ante. However, where there is some debate about the need, or value derived from a particular deliverable, then such measures risk forcing the MC to develop deliverables and undertake activities which divert attention from the primary objectives of improving service performance. The balance will depend upon the particular context.

Feedback on the value of the large number of deliverables specified in many existing contracts would be valuable in making judgements on the inclusion of requirements for deliverables in future contracts.

3.2 Incentive Function Shape

The categorisation of incentive functions into those that provide discrete incentives and those that provide continuous incentives is described in Section 2.1.2 above.

Discrete incentive functions can take the form of individual bonuses for achievement of individual performance targets (e.g. Kampala 2002-2004), or may comprise a series of stepped performance hurdles that each yield incentive payments. Discrete incentives have, however, been criticised for distorting incentives (Jensen, 2003). If a discrete performance standard is seen ex-post as unachievable then the standard ceases to have any incentive effect. Similarly once a performance target is achieved then the incentive to continue performance improvements is reduced. Gaming may also result, where effort, or results, are either brought forward or deferred so that they are declared in the period that maximises the incentive fee earned.

These distortionary problems can be mitigated by using continuous incentives that provide a marginal incentive at all levels of performance. Although, in practice, many of the performance incentives used in actual management contracts place upper and lower limits on the levels of performance that yield incentive payments and so there are often still some discontinuities.

Multiple performance measures are also often used and this raises the problem of ‘cherry picking’ of those incentives that offer higher marginal returns. Where achievement against two performance measures (or groups of measures) are considered essential then taking the product of the two measures in the incentive function ensures that the incentive fee can not be earned by concentrating solely on one measure. This approach was included in the incentive functions for Kathmandu, Yerevan and Kampala 2004-2006. The inclusion of maximum limits on performance incentives for individual measures, may also encourage managers to spread effort more widely over a range of activities so as to maximise incentive payments over a range of performance measures.

3.3 Strength of Incentives

The trade-off between incentives and insurance is central to the determination of the optimal intensity of incentives (Milgrom and Roberts, 1992). The management fee in all of the management contracts reviewed here contained some form of fixed fee and an incentive fee. The fixed fee provides a degree of insurance against high levels of uncertainty, while the incentive fee aims to overcome the moral hazard problem associated with that insurance. The balance is determined by the tendering process.

The fixed fee is determined by bidders and the intensity of the incentives is either also determined by bidders or is specified in the RFP.

Where the intensity of performance incentives is specified in the RFP, the principal selects the agent bidding the lower fixed fee. However, this approach requires the principal to determine the optimal intensity of incentives. In theory the principal will offer a contract which offers just sufficient incentive payments for the agent to apply the effort level preferred by the principal, and the principal will retain the remainder of the surplus. However this assumes that the risk tolerance of the agent, the uncertainty in performance measurement and the relationships between incentive and effort, and effort and performance are known to both principal and agent. In practice these factors cannot be known by the principal with any certainty ex-ante.

The variation in the intensity of incentives between contracts is clear from Tables 4 and 5. In part this variation is likely to result from the difficulty of estimating the optimal intensity of incentives ex-ante. In practice the optimal intensity appears often to be based upon subjective assessments of the intensity of incentives that it is perceived will provide a meaningful incentive (e.g. 50% of the fixed fee in the Kathmandu contract). *Guidance on the estimation of the optimal intensity of performance incentives, possibly drawing on incentive theory, would be extremely valuable for improving the accuracy of ex-ante estimates of the optimal intensity of incentives.*

The problem of determining the optimal intensity of incentives is complicated further when the incentive function includes multiple performance measures as it is then necessary to determine their relative importance and to allocate weightings. In theory, unless performance measures are weighted in such a way that the marginal net benefit is the same for all activities, those activities with lower marginal net benefits will receive no effort¹⁶ (Milgrom and Roberts, 1992). In practice weightings appear to be based upon subjective assessments of the respective importance of different measures.

¹⁶ Although, where there are diminishing returns to effort for each performance measure, then net benefits may converge as the returns on those activities that initially provide high net benefits reduce with effort.

Guidance on the determination of weightings for incentive functions that include multiple performance measures would be valuable for practitioners.

The advantage of allowing bidders to determine the strength of incentives is that they are better informed of their risk tolerance and of the sensitivity of effort to incentives. Provided that available information is provided to bidders, they are also reasonably well placed to estimate the uncertainty around performance measurement and the sensitivity of effort to performance. The problem with this approach is that if bidders are risk averse and if both the incentive fee and fixed fee are given equal weight in the tender evaluation, then bidders would minimise the management fee bid by bidding a fixed fee and zero incentive fee. To overcome the moral hazard problem associated with this outcome the tender evaluation has, in some cases, given greater weight to the incentive fee. However, this then raises the question as to what the most appropriate weights are. Furthermore, where performance incentives comprise a share of revenue, or a share of the residual, it is necessary to establish a forecast of revenue, or of the residual, for tender evaluation purposes (as in Amman). However, differences between the forecast and the expectations of bidders will influence the balance between the fixed and incentive fees bid.

The design of future management contracts will benefit from further analysis, possibly drawing on incentive theory and auction theory, of the advantages and disadvantages of tendering both fixed and incentive fees. Guidance would also be valuable on the weighting of the incentive fee during evaluation and on the treatment of forecasts used as the basis for tender evaluation (and also whether such forecast data should be revealed to bidders).

3.4 Baseline Data

Incentive functions can be divided into those that explicitly exclude baseline data from the calculation of the incentive fee and those that explicitly include it. Where baseline data is excluded from the incentive function, bidders are required to make their own assessments of the existing performance of assets and services, perhaps based upon information made available in a data room. Based upon this assessment bidders then make their own assessments of the effort required to achieve performance standards. Where existing information is poor, and where there are

concerns regarding misrepresentation of information, this approach can significantly add to the risk born by bidders in the process. With a risk averse bidder this will result in higher management fees, than if risk associated with baseline data were born by the government. It is important to note, however, that this problem is less acute with management contracts than with other forms of contract such as concessions, as with management contracts a degree of insurance is provided in the form of the fixed fee.

Of the contracts that made no use of baseline data in the incentive function, Gaza II, Kampala 2002-2004 and Kampala 2004-2006, all benefited from previous management contracts which were able to increase confidence in information on service and asset performance which reduces the need for baseline data to be explicitly included in the incentive function. In the Kathmandu contract, numerous studies had been undertaken on various aspects of water services over a prolonged period. This information was provided to bidders in a data room and on data CDs allowing bidders to make their own assessments of baseline conditions.

However, many contracts explicitly include baseline data in the incentive function so as to reduce uncertainty in the incentive fee. This might be done by relating performance incentives (say for UFW) to marginal improvements above a level determined by baseline data. In these cases baseline data is commonly confirmed after commencement of the contract. The principal problem with this ex-post determination of baseline data is that it immediately opens up the possibility of ex-post renegotiation. Without transparent competitive tendering pressures the process of ex-post renegotiation of incentives can result in incentives being watered down: this arguably occurred in the Trinidad and Tobago contract where performance measures were negotiated ex-post (Virjee and Gaskin, 2003). Alternatively protracted negotiations over performance measures and baseline data, as in the Rwandan contract, can delay substantive efforts to improve service performance. In fact if baseline data is collected in the first year of a contract, the MC actually faces perverse incentives to ensure that performance in the first year is as poor as possible. In some cases the problem of ex-post renegotiation is addressed by appointing an Independent Auditor to determine baseline data ex-post. This approach allows the MC time to

assess performance of the utility after commencement and to make representations to the independent auditor if necessary.

An alternative approach is to continue to use baseline data, but for the independent auditor to report ex-ante. This approach, adopted in the Amman contract, reduces the risk of misrepresentation¹⁷ of baseline data while avoiding the potential for delays associated with ex-post determination of the baseline.

3.5 Intertemporal Incentives

A particular issue with performance incentives is the ratcheting effect which occurs when performance incentives in the next time period are dependent upon performance in the current time period. Examples of performance incentives with ratcheting include those which provide a payment based upon improvement in performance over the previous year (e.g. Amman, Ghana, Kampala 2002-2004 and Yerevan). Particularly where maintaining performance improvements in future requires sustained effort, managers may consider that the potential incentive payment in the current year is not worth the sustained increase in effort that will be required over a number of years in future. In short, the extent of ratcheting, and the extent to which sustained effort is required, both effect the net present value of the incentive fee earned and so they will influence the effort exerted to improve service performance.

Although ratcheting of performance incentives during the period of a management contract may have demotivational effects, this problem disappears if the ratcheting occurs between contracts.

Further consideration of the prominence of the demotivational effects of ratcheting would be valuable in designing performance incentives for future contracts. In doing this it will be useful to consider whether particular activities (e.g. increasing coverage, or reducing UFW) require sustained effort over time to maintain

¹⁷ In some contracts critical data provided to bidders has been incorrect, and there have been allegations of misrepresentation of data. This can result in bidders making overly optimistic assessments of the potential incentive fee. Whether or not data was misrepresented, a management contractor could potentially use this as a premise to seek renegotiation. An independent audit ex-ante could potentially mitigate this problem.

performance achievements, or whether for some activities sustained performance improvements can be obtained through temporary one-off efforts. In the latter case ratcheting of performance incentives would have a more limited demotivational effect and would allow greater retention of surplus by the principal.

3.6 Negative Incentives

The majority of the management contracts considered in this report include incentive fees which reward improvements in performance. Often improvements in financial performance measures are the most important components of incentive functions. The incentive function, however, generally does not penalise the MC for deterioration in performance. As a result the MC is generally insured against the effects of poor performance¹⁸. This differs from other forms of contract such as concessions, where the agent, as the residual claimant, bears any losses from poor financial performance (up to a limit on liability).

In order to mitigate the moral hazard problem arising out of this insurance against poor performance in management contracts a number of devices are used which provide incentives even if the incentive fee proves elusive. Liquidated damages and withholdings for failure to achieve pre-defined service quality standards and deliverables were included in five of the thirteen management contracts reviewed. When the timing of activities is not crucial, withholdings are preferable to liquidated damages as they provide incentives even if the deadline for achievement is exceeded.

A problem with liquidated damages and withholdings is the determination of the amount of damages or withholding to be made. In principal liquidated damages should reflect the magnitude of the loss that results from the failure to achieve the specified performance standard. In practice this amount is difficult to determine with accuracy ex-ante. In the Gaza II contract, the amount of damages is the same for all of the 54 performance standards identified as being associated with liquidated

¹⁸ Although, if bidders cut the fixed fee bid below cost on the assumption that some costs will be covered by the incentive fee then the extent of insurance against downside risk is reduced.

damages. In the Amman contract the majority of liquidated damages are expressed as percentages of the incentive fee and so are variable. In neither of these cases can the liquidated damages be realistic estimates of the damages incurred.

An alternative to the use of liquidated damages and withholdings is the use of a threat of termination. All of the contracts reviewed allowed for termination for breach of contract. However, this clause is seldom used and so seven of the contracts included thresholds for termination that were based upon scores derived from performance against a basket of performance measures.

Further consideration of approaches to the determination of liquidated damages and withholdings and of termination thresholds may prove valuable for practitioners. A further area that has not been considered is the different effects of positive and negative incentives on motivation and on relationships between principal and agent.

4. Conclusions

This work has highlighted considerable diversity in approaches to performance incentives in management contracts for WSS services. Incentive mechanisms vary across a number of dimensions including: the performance measures used; the intensity of incentives; the nature of incentive functions; the bidding process; the treatment of baseline data; ratcheting effects; and negative incentives. In some cases differences in incentives can be attributed to differences in context (for example depreciation could not be included into the Amman performance measures due the lack of a detailed valuation of fixed assets) but other differences are more difficult to attribute to context (for example, why in some cases is the incentive fee tendered, while in others it is not). It is likely that the previous experience of advisors, or the precedent contracts available, has some influence on the design of performance incentives. There is some commonality between some of the contracts reviewed suggesting that they were developed with the form of previous contracts in mind, however incentive design does not appear to have converged towards any one form.

More detailed investigation, including further interviews with those involved in developing the contracts may shed more light on the reasons for different approaches. Although a few such interviews have been conducted as part of this study, in many cases the appropriate practitioners were not available for interviews during the relatively short study period. Also, in many cases access to project documents has been limited to draft versions of the management contract, and in some cases only secondary sources have been available.

Detailed evaluation of, and recommendations on, the design of performance measures for management contracts are beyond the scope of this report, which aims to identify issues to be considered during the more detailed study that is proposed. The report has demonstrated that practitioners developing management contracts face substantial choices in the design of performance incentives. A number of questions have been identified in Chapter 3, above, which highlight some of the problems involved in making these choices. Further research, drawing on incentive theory, theory of contracts, and auction theory, as well as information on the performance of existing

management contracts for WSS services, will be invaluable to practitioners grappling with these problems in future.

Furthermore research into performance incentives in management contracts may also prove valuable in the design of incentives for performance contracts within the public sector (e.g. Kampala 2004-06) and also in the design of incentives for other types of private sector participation, such as affermage contracts, where incentives, other than simply a claim on the residual, have in some cases been used (e.g. Senegal).

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