

Public–private partnership conceptual framework and models for the funding and financing of water services infrastructure in municipalities from selected provinces in South Africa

Cornelius Ruiters^{1,2*} and Maselaganye P Matji^{1,2}

¹Council for Scientific and Industrial Research (CSIR), Built Environment, P.O. Box 395, Pretoria, 0001, South Africa

²University of South Africa, Graduate School of Business Leadership, P.O. Box 392, UNISA, 0003, South Africa

ABSTRACT

This paper presents public–private partnership (PPP) framework models for funding and financing of water services infrastructure at local government (municipalities) level (sphere) in South Africa. Data were assembled from various stakeholders, viz., private and public sector institutions in the Gauteng and Limpopo Provinces of South Africa. The framework for PPPs identified three models, viz. state, hybrid and private sector models. In the 'state model' the water services value chain is 100% government funded and owned infrastructure. Government is a key player in infrastructure investment and inefficiencies within the public expenditure management systems are particularly detrimental, e.g., there are significant problems in spending of infrastructure budgets. In the 'private model' harnessing the significant potential for capital markets to finance water infrastructure, particularly local bond markets, is contingent on their strengthening and further development. Well-functioning and appropriately institutional investors (pension funds, insurance companies, etc.) would be natural sources of long-term financing for water services infrastructure because liabilities would better match the longer terms of water infrastructure projects. The 'hybrid model' is in the middle of the water services value chain, i.e., a partnership between government and the private sector. The use of this framework is essential in the including of the private sector in the implementation of water infrastructure development projects. The research results highlight the underlying principles that underpin, support, determine and confirm the success of the PPP models and value chain framework for local government water infrastructure in South Africa. Twelve key parameters were identified that would drive the success of any water services infrastructure PPP model. Even though PPP is an alternative procurement vehicle, PPP models are considered to be used as vehicles for addressing institutional challenges in local government. However, in most cases it has been indicated that lack of technical and financial skills and monitoring of the private operator are serious challenges.

Keywords: financing, funding, Gauteng and Limpopo Provinces, PPP framework, PPP models, water services infrastructure

INTRODUCTION

Many developing countries need water infrastructure to improve the livelihoods of their citizens and their quality of life, and South Africa is no exception. While there are many constraints to the delivery of water services infrastructure, one of the most obvious factors that hampers delivery is project costs. Access to finance is the lifeblood of water services infrastructure delivery, as is the packaging of the funding model for each project or groups of projects. Unfortunately, the cost of water services infrastructure delivery continues to escalate to the point where many developing countries simply cannot afford such infrastructure.

The backlog of water infrastructure provision and poor access to service delivery for poor communities have forced a new approach for governments, industries, financiers and other role players. Delays escalate the eventual cost of infrastructure even more. Countries like South Africa have no choice but to look at innovative approaches, such as public–private partnerships (PPP) models, to ensure that they eliminate their water infrastructure backlogs. Efficient and productive water services infrastructure are important inputs for all industries and hence vital for economic growth and efficiency, productivity and competitiveness. Continued growth in infrastructure

productivity will play a crucial role in managing the emerging challenge of South Africa's growing population (DBSA, 2009; DWAF, 2004, 2008).

The Department of Water Affairs (DWA, now the Department of Water and Sanitation) traditionally funded water infrastructure development projects in South Africa (DWAF, 2003, 2004, 2008; DBSA, 2009; Moseki et al., 2011; Ruiters, 2011). With the growing demands on water infrastructure, no appropriate and alternative analyses and models have since been proposed and finalised. There is therefore pressure to consider alternative funding models for improved water services infrastructure management, particularly by investigating relevant PPP funding models (World Bank, 1994; Matta and Ashkenas, 2003; ADB, 2008; Ruiters, 2011, 2013; Matji, 2013; Matji and Ruiters, 2015a, b).

Municipalities (with water services authority status) are facing various challenges such as the lack of technical, planning and management skills, limited financial resources, and lack of operation and maintenance resulting in dilapidating and aging water and sanitation services infrastructure. There has been rapid decentralisation of the responsibility for the provision of water services (water and sanitation), with massive spending and development to achieve universal access, which has occurred in tandem with massive changes (transformation) in the form and function of local government (DPLG, 2000a, 2000b; DWAF, 1997a, 1997b, 2003; NT, 2003, 2013c; DCoG, 2010; Eales, 2011). The role of local government has been fundamentally reconceived and reconfigured as the primary driver and enabler of

* To whom all correspondence should be addressed.

e-mail: CRuiters@csir.co.za

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development, i.e., water services (DPLG, 2000a, 2000b; DWAF, 1997a, 1997b, 2003; NT, 2003, 2013c; DCoG, 2010; Eales, 2011). Municipalities (with water services authority status) have to find creative and innovative models that can assist in responding to water services infrastructure delivery needs. In South Africa, a few municipalities contracted private sector operators during the 1990s under lease or concession contracts (Marin et al., 2009). The primary objectives of this research were: (i) to develop a public-private partnership (PPP) conceptual framework; (ii) the identification and review of PPP models for funding and financing of water services infrastructure at local government (municipalities) level (sphere) in South Africa; and (iii) to determine key principles and parameters (variables) that should inform the development of a cost-effective PPP model to ensure sustainability of local government water infrastructure.

METHODS

Data collection

The primary and secondary data collection methods for the research involved the following (Coldwell and Herbst, 2004; Tustin et al., 2005):

Primary data

Data were collected from a sample of 24 participating water sector organisations using a Likert scale questionnaire and the purposive sampling method. Homogeneous sampling as a purposive sampling technique was used to achieve a homogeneous sample; that is, a sample whose units (e.g., people, cases, etc.) share the same (or very similar) characteristics or traits (e.g. group(s) of people that are similar in terms of background, occupation, etc.). Participants were chosen to represent a homogeneous sample since the research questions were specific to the characteristics of the particular group of interest. Participants included officials and politicians from municipalities in the study area (Gauteng and Limpopo Provinces of South Africa), Rand Water, Umgeni Water, Magalies Water, Johannesburg Water, East Rand Water Care Company (ERWAT), local and international private companies with an interest in water and sanitation infrastructure within and outside the study area, the Development Bank of Southern Africa, officials from the national Department of Water Affairs (now the Department of Water and Sanitation), National Treasury and water user associations operating in the study area. The sample represented individuals with special technical and financial expertise and knowledge of water infrastructure finance, planning, development, policy and regulation.

The primary data were collected from the Gauteng and Limpopo Provinces by questionnaire (Appendix 1). These two provinces were selected for primary data collection since most of the PPP contracts/agreements were concluded and are operating in a number of municipalities (water services authorities) within them. Data were assembled in the period May–August 2013. Methods that were used to assemble the data included:

- E-mail correspondence with participants. Some participants compiled a comprehensive write-up of their views by e-mail. This was over and above questions raised in the questionnaire.
- One-on-one interviews with participants. Meetings were arranged to present completed questionnaires and provided an opportunity to ask more questions and assemble additional data.

- Group discussions on and debates on public-private partnerships (PPP). This implies that responses presented were a consolidation of different views, ideas, perceptions and understanding of public-private partnerships.

Secondary data

Reviewed reports relating to water services infrastructure needs and funding in the Gauteng and Limpopo Provinces, and additional research information on water services PPP funding models were obtained from case studies in other provinces (DCoG, 2010; DWA, 2010, 2011, 2012a, 2012b, 2012c, 2013; NT, 2011a, 2011b, 2011c, 2011d, 2013a, b, c, d). Data obtained from physical documentation were also provided by some of the participants.

Statistical analysis

For the quantitative data analysis, (i) nominal (categorical); and (ii) ordinal (ranked) data (scales) types were considered and used, where appropriate (cf. Taylor, 2002; Coldwell and Herbst, 2004; Tustin et al., 2005). The non-parametric chi-square (χ^2) test statistic was used to determine whether dependency (or contingency) exists between the PPP models key financial variables (i.e. awareness, success, appropriateness, (economic) viability and attractiveness) and evaluation criteria (i.e. strongly agree, agree, neutral, disagree and strongly disagree) identified from the primary data collection (cf. Coldwell and Herbst, 2004; Tustin et al., 2005). The arcsine \sqrt{x} was used for the data transformation before application, where appropriate (cf. Tustin et al. 2005).

RESULTS AND DISCUSSION

Public-private partnership (PPP) value chain framework models

The results of the study identified three overarching models within the PPP value chain framework (Fig. 1):

- **State model:** The water services value chain is 100% government funded and owned infrastructure. Government is a key player in infrastructure investment and inefficiencies within the public expenditure management systems are particularly detrimental, e.g., there are significant problems in spending of infrastructure budgets (DCoG, 2010; NT, 2011d, 2013b, c; DWA, 2012a).
- **Private model:** The other extreme of the water services value chain is 100% private sector funded and owned infrastructure. Harnessing the significant potential for capital markets to finance water infrastructure, particularly local bond markets, is contingent on their strengthening and further development. Well-functioning and appropriately institutional investors (pension funds, insurance companies, etc.) would be natural sources of long-term financing for water services infrastructure because liabilities would better match the longer terms of water infrastructure projects (cf. Inderst, 2009; World Bank, 2010; TCTA, 2012).
- **Hybrid model:** In the middle of the water services value chain is a hybrid model, i.e., between government and the private sector. An institutional framework was developed to guide this type of development (NT, 2000; OECD, 2008, 2010, 2012; DCoG, 2010). The use of this framework is essential in including the private sector in the implementation of water infrastructure development projects

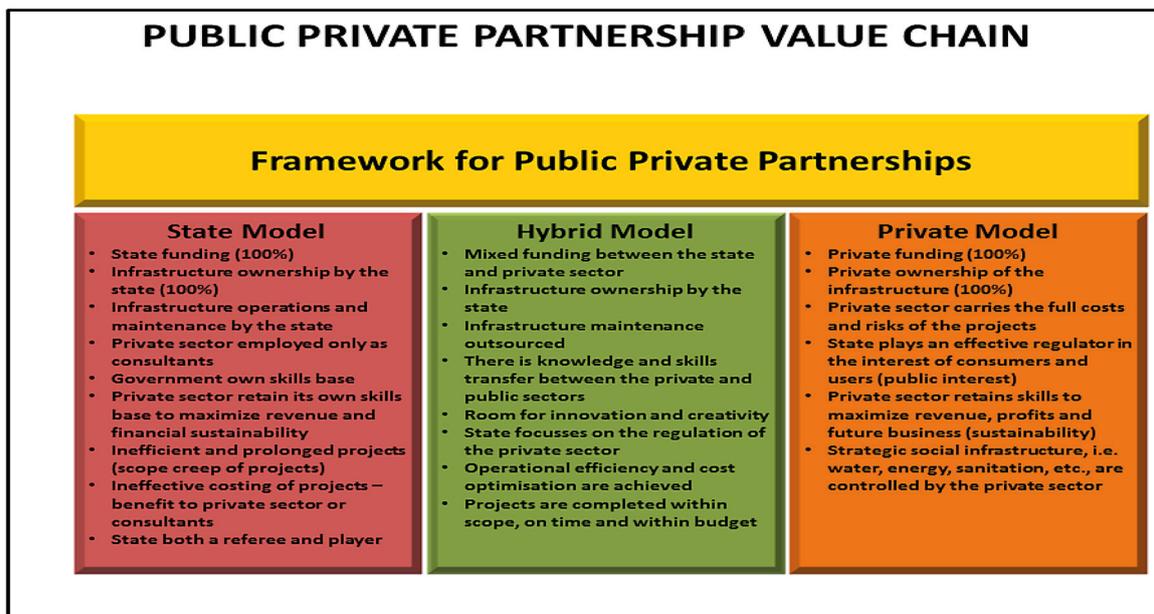


Figure 1

Public-private partnership value chain framework and models for water services infrastructure from data collected in the Limpopo and Gauteng Provinces of South Africa

(NT, 2000, OECD, 2012). Meaningful involvement by the private sector is, however, not automatic but subjected to important prerequisites for such financing, i.e., political commitment, enabling legislation, evaluation framework, expertise, project prioritisation, risk management, and standardisation (RCCAO, 2006; Sihombing, 2008; OECD, 2008, 2010, 2012; ADB, 2008; Rowey, 2009; Laitinen et al., 2010; Leach, 2010; UNESCAP, 2011; KPMG, 2011; MOF, 2012).

In addition, the research results highlight the following underlying principles that underpin, support and determine the above-mentioned overarching PPP value chain framework derived from the selected municipalities within the Gauteng and Limpopo Provinces in South Africa (cf. Table 1; NT, 2000; ADB, 2008; MOF, 2012; OECD, 2012):

- Comprehensive feasibility study: Any PPP contract should be informed by an in-depth analysis of the technical, financial, social and legal aspects of the project.
- Contract management regime: PPP contracts are managed as part of the project planning process.
- Long-term contractual arrangement compliance: A municipality must adhere to due processes; however, the contract should be reviewed every 3 years.
- PPP contractual arrangements: must be carefully scrutinised prior to finalisation to ensure that the consumer's interest is protected. PPP contracts must adhere to a social and commercial balance.
- PPP contracts: Approvals should be centralised and managed by the National Treasury to minimise potential abuse and promote competitive advantages.
- Assessments and/or due diligence: Based on the current trends private sector institutions approach municipalities to negotiate PPP contracts instead of them taking a decision on whether the infrastructure challenges should be addressed through PPP contracts.
- Timeframe of PPP arrangements: Municipal officials and

politicians must take into account that PPP arrangements will only make sense if the contract is long-term (e.g. > 10 years).

- Strong enforcement of regulations for all PPP contracts: There seems to be little or no support for effective regulation of PPP arrangements. In local government, a shortage of technical and management skills makes it more difficult for PPP contracts to be managed or monitored.
- Revenue flows or ability to recover the debt quicker: The length of the PPP contracts should enable municipalities to recover debt over a shorter timeframe. This implies that the contract be structured in such a way that there is no penalty for early settlement of the debt.

Comparative assessment of PPP governance models

The conceptual PPP value chain framework model parameters derived from the results are presented. Some 50% of the respondents were aware of the PPP models for the delivery of water services infrastructure in the study area, whereas about 67% of the respondents were aware of the existence of PPP models in the water sector and other sectors of the economy (Fig. 2). Furthermore, 12 key parameters were identified that would drive any water services infrastructure PPP model (Table 1). PPP models allow the public and private sectors to forge efficient partnerships and enable a robust pipeline of economic water services infrastructure to be built around the country without delay. From the results it was found that approximately 65% of the participants agreed that PPP contractual arrangements that they are aware of are yielding desired results (Fig. 3). However, it does not necessarily mean that there are not challenges with such PPPs. Some 22% of the participants who expressed a neutral view believed that current challenges in some of the PPPs are serious and could derail the PPP arrangements if they are not addressed. After the introduction of the National Free Basic Water Policy (DWAF, 2003), the culture of payment for services declined. Consequently, this led to the renegotiation of the concessionaire

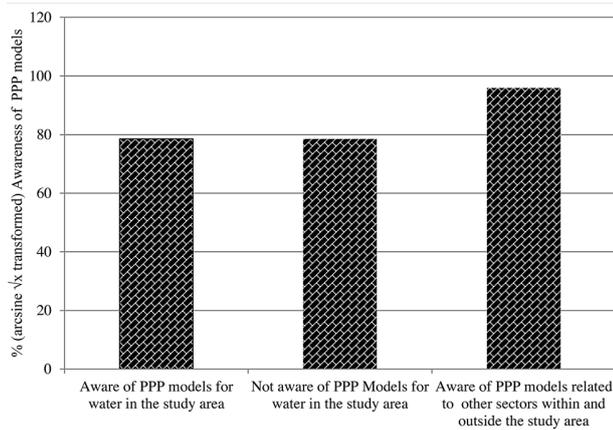


Figure 2

Percentage awareness (arcsine \sqrt{x} transformed) of PPP models for water services infrastructure delivery at local government level in the Gauteng and Limpopo Provinces of South Africa

to shift the risk back to municipalities (Bender and Gibson, 2010). New elements that were incorporated as an addendum to the original contract were: (i) exemption from committing further investment of concessionaire's own funds; (ii) receive operating subsidies as partial payment for unpaid bills as well as capital subsidies for infrastructure investment in previously underserved areas; and (iii) eliminating of large annual payments to the municipalities. In addition, there is no strong contract management by municipalities due to lack of technical skills. Importantly, these types of PPP models allow the public sector to provide capital that can also earn a potential return and is recycled (cf. Lang and Merion, 1993; AASHTO, 1995; Goodman and Hastak, 2006; ADB, 2008). The PPP models are typically a variation of the design-build-finance-operate (DBFO) model or the design-build-operate (DBO) model (NT, 2000; ADB, 2008; OECD, 2008, 2010, 2012; MOF, 2012):

- **Design-build-finance-operate (DBFO) model** – the most common form of PPP, involving the integration of these four functions, design, build, finance and operate, within one PPP service provider. The PPP provider will secure its own financing to build, maintain and operate the facilities to meet the public sector's requirements.
- **Design-build-operate (DBO) model** – the public sector provides the funds for the design and building of the facility, and then continues to engage the same private vendor to operate the facility. The operator is then paid a management fee according to performance standards. This model may be suitable for very large projects which the private sector is unable to finance wholly.

Even though PPP is an alternative procurement vehicle, about 54% of the participants agreed that PPP models can also be used as vehicles to address institutional challenges in local government (Fig. 4). In most of the case studies considered in this research, PPP models are managed through service level agreements or memoranda of understanding between the government institution and a private company. However, in most cases it has been indicated that lack of technical skills and monitoring of the private operator are serious challenges (Bender and Gibson, 2010). All municipalities in the study area engage private sector institutions through an open tender system. In such cases, the full project, technical, financial, legal and contractual risks reside with the municipality, i.e., the **state model**. In this type

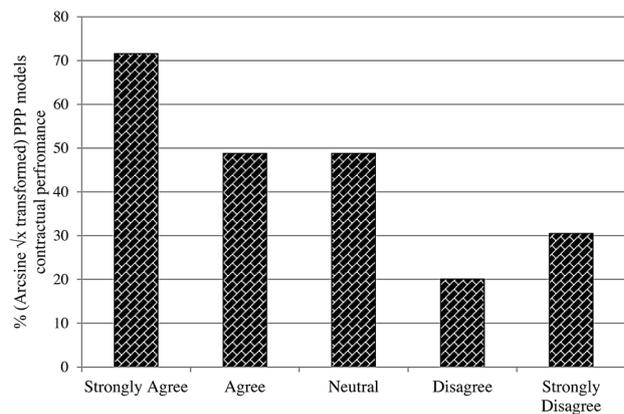


Figure 3

Percentage (arcsine \sqrt{x} transformed) of respondents agreeing/disagreeing on the performance of contractual arrangements for PPP models at local government in the Gauteng and Limpopo Provinces of South Africa

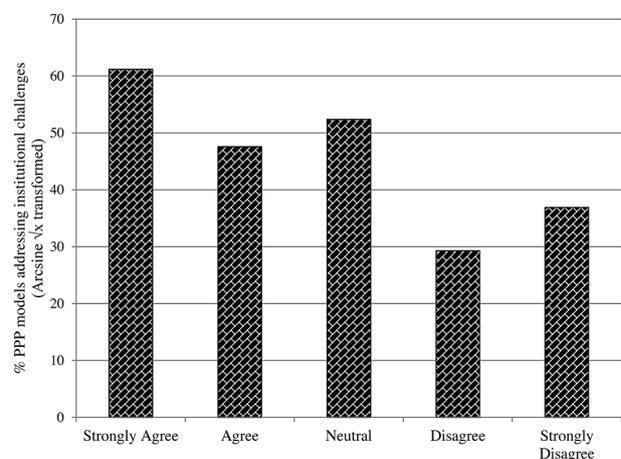


Figure 4

The extent to which participants agree/disagree (arcsine \sqrt{x} transformed) that PPP governance models address institutional arrangements at local government

of arrangement, there is no incentive for the transfer of skills, creativity and innovation to achieve operational efficiency.

These results and case studies from the Gauteng and Limpopo Provinces have confirmed that well-structured PPP models for water and sanitation infrastructure can be a success, on condition that there are sufficient revenue streams and the contract suits all parties involved (cf. Moleke, 2000; ADB, 2008; Bender and Gibson, 2010; OECD, 2010; KPMG, 2011; Matji, 2013). In general, municipalities need education, awareness and training on the functions, benefits, challenges and other implications of PPP models. Lack of technical, management and legal capacity of municipalities make it difficult for PPP models to be successfully implemented in local government. Even though the results have indicated that investors or financiers have interest in local government water infrastructure, lack of technical oversight remains a challenge. In order to gain maximum benefit from all PPP arrangements across the water sector or other sectors, approval and finalisation of PPP contracts should be centralised. The National Treasury's Public Private Partnership

TABLE 1
Comparison of PPP models in terms of 12 parameters for water services infrastructure delivery at local government in the Gauteng and Limpopo Provinces of South Africa

No.	Model parameters	Parameters of the State Model	Parameters of the Hybrid Model	Parameters of the Private Sector Model
1	Technical/project risk	100% of the technical and project risk is carried by the state.	There is shared risk between the state and private sector. The range is between 10% and 90%.	100% of the risk is carried by the private sector.
2	Financial risk	100% of the risk is carried by the state. The state funds everything.	The risk is shared by both the state and private sector institution. The range is between 10% and 90%.	100% of the risk is carried by the private sector. Private sector funds everything.
3	Contractual risk	The state carries the full risk.	The risk is shared by both parties.	The private sector carries the full risk.
4	Skills and knowledge transfer	Private sector will not prefer transferring skills and knowledge to government officials because it might put them out of business.	Transfer of skills and knowledge can easily be enforced and there will be willingness from the private sector.	Private sector prefers to retain skills to maintain competitive advantage.
5	Roles and responsibilities of state institutions	Implementation of local government infrastructure is the mandate of local authorities. Section 152 (b) of the Constitution of the Republic of South Africa. National Departments and state-owned entities support local government (section 154 (1) of the Constitution of the Republic of South Africa). National government can easily be caught in conflicting roles of implementation, policy-making, and regulation.	Local government remains the implementer but with the support of private sector institutions and state-owned entities. Strong and independent water sector regulator is required.	Private sector implements on behalf of local government. Very strong and independent water sector regulator is required.
6	Affordability and revenue flows	Heavy reliance on government grants. Some schemes implemented with appropriate revenue flow and affordability assessments. Sustainability of infrastructure becomes a serious challenge.	Affordability and revenue flows are prioritised, because these might have a negative effect on business operations. Proper assessments are conducted prior to full-scale project implementation. Private sector invests on the basis of government subsidy to either capital or revenue.	Affordability and revenue flows are of highest priority. Private sector invests on the basis of return on investment or return on equity.
7	Value for money	There is a high chance of financing operational inefficiencies in the system. There are limited chances that consultants or service providers will focus on value for money when supporting government. Operational efficiency and cost optimisation is of highest priority. The intention is to maximise profits and reward shareholders.	Operational efficiency and cost optimisation prioritised.	
8	Ownership of infrastructure	The state owns the infrastructure.	The state owns the infrastructure.	The ultimate owner of the infrastructure can be the private sector. This is once the debt is settled.
9	Socio-political concerns/issues	Section 152 (e) of the Constitution of the Republic of South Africa mandates local government to encourage the involvement of communities and community organisations in the matters of local government. Sometimes decisions on payments for services are imposed because government will subsidise.	Effective engagement of communities is prioritised as required by law because of private sector involvement and levels of subsidy required as prescribed by contractual obligations between the parties.	Socio-political concerns are of highest priority because negative outcomes can affect the bottom-line of the business. If such concerns are not addressed, there are chances that the investor will not invest.
10	Funds following functions	Funds should follow function as required by the Public Finance Management Act/Municipal Finance Management Act. Funds for local government water infrastructure should go to municipalities directly.	Funds for either capital contribution or revenue subsidy should flow through the municipality.	Private sector recovers costs from users either directly as per agreement with the municipality or the municipality recovers costs on behalf of the private sector.

TABLE 1 (continued)

No.	Model parameters	Parameters of the State Model	Parameters of the Hybrid Model	Parameters of the Private Sector Model
11	Technology and innovation	There is a limited chance that the state will benefit from technology and creative solutions. There is a high chance of a private sector institution using state funds to develop technology that will be sold back to the state at a high cost.	There is shared creativity and technological innovations between the state and private sector. Creative solutions are explored to maximise profit and achieve operational efficiency.	Creative solutions and high levels of innovation are of highest priority. These are used as tools for achieving operational efficiency and cost optimisation.
12	Open and transparent procurement process	Private sector services are procured through an open tender system. Sometimes functionality, knowledge and expertise do not drive the awarding of the tender. Government carries the risk of failure alone and can always inject more funds to correct the situation.	Open tender system is used but the private sector institutions must prove that they have the capabilities to deliver desired services. Failure to deliver could lead to the collapse of the business operations.	Open tender system is used. Private sector capabilities and performance requirements are of highest priority, else shareholder needs will not be realised.

Unit should be mandated to review all local government PPP contracts and approve them after conducting due diligence (cf. NT, 1999, 2000, 2003; OECD, 2010, 2012).

There have been attempts to involve the private sector in public-private partnerships models for the creation of water services and wastewater infrastructure but not with the commitment, consistency, or the legislative protection that would encourage and protect private sector investment and encourage long-term partnerships (Moleke, 2000; Bender and Gibson, 2010; DCoG, 2010; Ruiters, 2011; Matji, 2013). However, there are several contracts with private operators for water services and wastewater infrastructure provision which include the following:

- In the Ekurhuleni Metropolitan Municipality, the Council for Scientific and Industrial Research (CSIR) was involved in a public-private partnership for biogas generation in wastewater treatment plants, i.e., the up-scaling of the technology for biogas (sludge to energy). The partners in this PPP model transaction are Barloworld Power, East Rand Water (ERWAT), CSIR, University of Pretoria and the Development Bank of Southern Africa (DBSA) as the project financier. Funds were sourced from the Green Fund. Barloworld Power will provide operation and maintenance of the generators for a period of 7 years, whereas the CSIR will continue with research and development related work and further support for 2 to 3 years after project completion. Operation and maintenance costs will be recovered from the sale of biogas produced. ERWAT owns the wastewater treatment plant or overall infrastructure in which the technology will be up-scaled.
- The City of Johannesburg took a strategic decision to corporatize its water and sanitation services (i.e. Johannesburg Water) and keep these under public management over the long term (Marin et al., 2009). This was achieved through the management contract between the City of Johannesburg and a consortium of international operators led by Suez (Marin et al., 2009). This management contract was secured through an open tender system. The primary aim of the PPP was not to transfer the utility to a private operator over the long term, but rather to leverage the expertise of an experienced operator for a few years in order to establish a viable, corporatized public water utility (Marin et al., 2009). Johannesburg Water is a product of a successful public-private partnership model in water, which evolved into a public-public partnership (i.e. City of Johannesburg Metropolitan Municipality and

Johannesburg Water). Even though Johannesburg Water was established as a municipal entity in terms of the Municipal Systems Act (DPLG, 2000), it is now operating as a public-public partnership model or corporatized water utility with the City of Johannesburg (CoJ) responsible for revenue, billing, and collection from consumers and Johannesburg Water (JW) is responsible for operating and maintaining both water and sanitation infrastructure (JW, 2012). The entity is also responsible for capital infrastructure development, renewal and rehabilitation to ensure uninterrupted supply of services. The entity is responsible for a water distribution network of about 11 000 km, 11 000 km of wastewater collection network and over 100 reservoirs. The entity purchases 1 470 ML/day of water from Rand Water and also treats about 980 ML/day of wastewater (JW, 2012). Johannesburg Water has entered into a 7-year PPP arrangement for the biogas project in its Northern Works Wastewater Treatment Works. The arrangement was finalised in 2012. The contractual arrangement is structured in such a way that Johannesburg Water purchased some of the biogas-fuelled generators and the contractor invested in other required capital infrastructure. The PPP arrangement is based on the design-build-operate-maintain model for a period of 7 years. After 7 years, the contractor will hand over the infrastructure to Johannesburg Water. The contract will recover its costs from the sale of biogas generated from the operations.

- The City of Tshwane entered into a public-private partnership with Magalies Water Board, ABSA Bank and Bigen Africa, in the construction of a 60 ML/day water purification plant. ABSA Bank was the financier, Bigen Africa was the consulting engineer responsible for the engineering design and implementation oversight, Magalies Water was charged with the responsibility of operation and maintenance of the facility after completion, and the City of Tshwane was the beneficiary (Matji, 2013). The total value of the project was R500 million. The PPP model was used as a vehicle for ring-fencing bulk water and sanitation services. The contract was for a period of 20 years. Its success was based on sustainable revenue flows to the City of Tshwane.
- In the Mogalakwena Local Municipality, located within the Waterberg District Municipality of the Limpopo Province, there has been only one public-private partnership project for a period of 30 years (Matji, 2013). The PPP arrangement is for the Doorndraai pipeline from Doorndraai Dam to Mokopane town. The entire capital cost was borne by

the mines against a 30-year agreement for the sale of final effluent by the Mogalakwena Municipality to the mines. The contractual arrangement between the mines and the Mogalakwena Municipality is currently managed jointly by the Mogalakwena Local Municipality and Lepelle Northern Water Board. Even though the PPP arrangement in the Mogalakwena Local Municipality seems to be successful, some raised contractual challenges that could compromise the municipality. The shortcomings of this PPP model arrangement are that project life-cycle costs were not factored into the contractual arrangement. Factors such as operation and maintenance costs, finance charges, and depreciation of the assets were not taken into account.

- Other potential PPP model arrangements were: (i) the bulk water services pipeline project from Flag Boshielo to Mogalakwena town which included the Department of Water Affairs, Mogalakwena Local Municipality and the mines in the Waterberg District (NT, 2013c); and (ii) the feasibility stage of the Lephalale bulk and reticulation water services infrastructure between the Lephalale Local Municipality, National Treasury and a transaction advisor (NT, 2013c).

The above-mentioned PPP models were highly successful within these provinces as a result of the following (Moleke, 2000; Bender and Gibson, 2010; DWA, 2012c; Matji, 2013):

- Well-structured public-private partnerships models for water and sanitation infrastructure can be a success, on condition that there are sufficient revenue streams, appropriate contracting models and that all parameters for the framework of PPP models are taken into account. These were initiated to improve performance, encouraging private participation and improving governance from within. PPP occurred with most having been lease contracts (or *affermage*) to ensure good control of the management and operations of the water and sanitation systems.
- Access to water supply for households in the concession areas increased from 47% to 94% since 2010.
- Water and effluent quality is excellent in the systems operated by the concessionaire.
- Infrastructure operated by the concessionaire is in good order, due to a strong maintenance programme.
- The concessionaire has virtually spent 100% of the capital

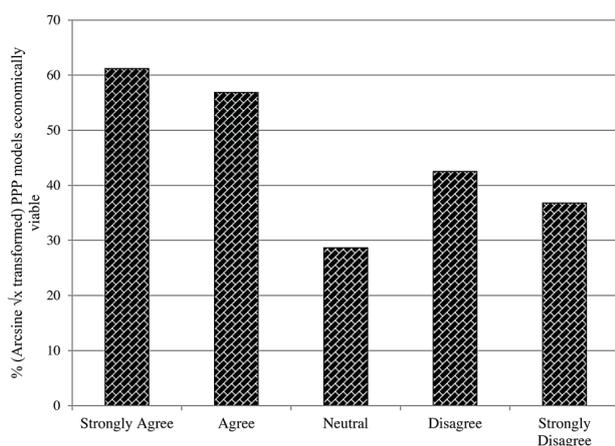


Figure 5

Percentage of respondents (arcsine \sqrt{x} transformed) agreeing/disagreeing on the economic viability of existing PPP models in the Gauteng and Limpopo Provinces of South Africa

grant for extending and upgrading infrastructure in formerly under-served areas.

- The concessionaire has a very good employee training and development programme. This is also complemented by well qualified and competent staff members.
- Tariff levels in the concession areas are similar or lower for comparable municipalities.

Key financial variables for PPP models for water services infrastructure at local government

The results demonstrate that the key financial (awareness, success, appropriateness, (economic) viability and attractiveness) and evaluation criteria for the PPP models are independent and not associated, with $\chi^2 > 16.92$, $\alpha = 0.05$ and v (degrees of freedom) = 9. Thus, the value of the χ^2 test statistic ($\chi^2 = 72.203$, $P < 0.001$) exceeds the critical value of χ^2 , at $\alpha = 0.05$ level of significance (Figs 5–8). This is highlighted in that approx. 52% of the respondents agreed that PPP models take into account all key variables that can affect their sustainability (Fig. 5). Some 62% of the participants believe that PPP models are economically viable or financially sustainable. On the contrary, about 30% believe that they are not economically viable because of revenue streams and the highly politicised local government environment. About 83% of the participants agreed that PPP models should be used to address operation and maintenance challenges for water and sanitation infrastructure (Fig. 6). Whereas some 58% of the participants strongly agreed that PPP models are appropriate vehicles for addressing the funding and financing of water services infrastructure operation and maintenance challenges at local government level (Fig. 6). However, the success of the PPP model(s) would depend on the status or condition of the infrastructure at the time of transfer or take-over. About 61% of the participants agreed that water sector PPP models are attractive to investors and financiers because of potential revenue streams from users and subsidised grants by the national government (Fig. 7).

Furthermore, the results presented in Fig. 8 demonstrate that 67% of the participants agreed that PPP models for water infrastructure are successful in funding and financing local government infrastructure. Their view is based on the municipality conducting a proper feasibility assessment, ability to collect revenue, long-term revenue streams and affordability, appropriate and transparent procurement processes and

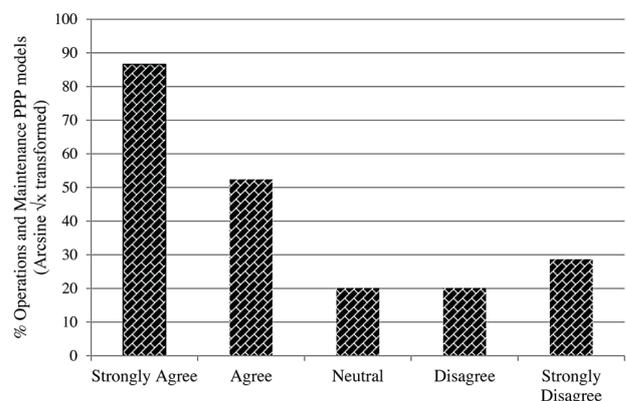


Figure 6

Percentage of respondents agreeing/disagreeing (arcsine \sqrt{x} transformed) on the use of PPP models to address operation and maintenance in the Gauteng and Limpopo Provinces of South Africa

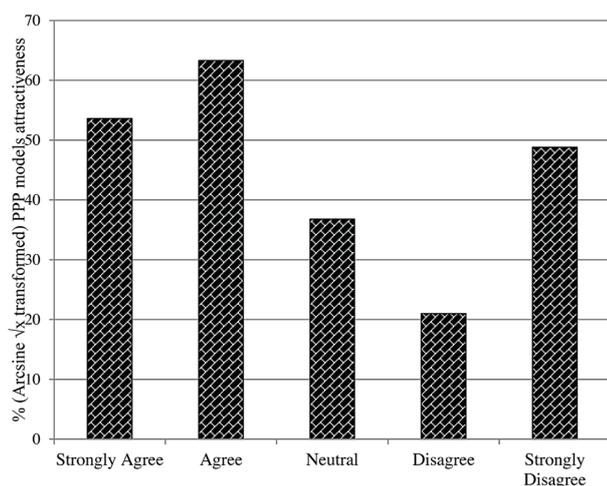


Figure 7

Percentage of respondents agreeing/disagreeing (arcsine \sqrt{x} transformed) on the water services infrastructure PPP model arrangements that are attractive to investors and financiers in the Gauteng and Limpopo Provinces in South Africa

appropriate well-structured contracts (Mokele, 2000; Bender and Gibson, 2010). Some of the respondents who disagreed believe that the current legislative framework makes it difficult for PPP arrangements to be put in place or even to function effectively. About 96% of the participants agreed that PPP models are appropriate for financing local government water infrastructure (Fig. 8). This is subject to the presence of a strong and independent water sector regulator and other regulatory mechanisms, i.e., competition commission regulation, capping of water use charges and/or tariffs (pricing), regulatory impact assessments, etc. Enforcement of legislative and regulatory frameworks should also be effective to ensure that the water users' interests are protected. The appropriateness of the model is also subject to appropriate technical and management skills in local government. Agreement was also based on the presence of an enabling legislative environment designed in such a way that it supports PPP arrangements. About 66% of the participants agreed that PPP models are appropriate vehicles for financing local government infrastructure during difficult economic conditions (Fig. 8). Some 29% of the respondents who were neutral indicated that it also depends on whether such economic conditions are not directly affecting the private sector institutions and the ability to pay for services. Thus, the above results illustrate that government must embrace and lead innovative financing, i.e., PPP funding models, as one of the preferred alternatives to deliver certain water services infrastructure projects (Figs 4–8).

CONCLUSIONS

The South African Government has recognised that new delivery models, i.e., PPP models, are required to close the infrastructure delivery gap to extend access of water and sanitation services to communities. These include the long-term growth and water services infrastructure renewal planning across the provinces, determining project priorities, and utilising the expertise in the public and private sectors to manage the implementation of water services infrastructure through innovative financing (such as PPP models). With overwhelming demand

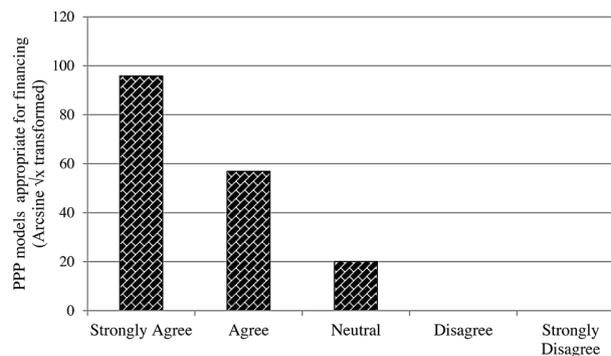


Figure 8

PPP models (arcsine \sqrt{x} transformed) are appropriate for financing local government infrastructure in the Gauteng and Limpopo Provinces of South Africa

for the provision of water services infrastructure assets to be accelerated around the country, implementation of any of PPP models will go a long way towards leveraging private sector investment in economic infrastructure assets and allowing the government to recycle its capital for socio-economic needs and development, while at the same time addressing demand risk.

The research results demonstrate that the ability of the municipalities to guarantee payment of services should be considered prior to finalising the PPP arrangements. Key variables that inform PPP financing arrangements are: (i) amount of debt required; (ii) ability to repay the debt; (iii) nature of the project(s); (iv) transfer of project risks such as design, construction and maintenance; (v) value for money; and (vi) financial and socio-political uniqueness of each municipality. Buy-in of key stakeholders such as consumers or local community is crucial and without their buy-in the project(s) will fail. Cost-reflective tariffs are essential for the success of PPP models. National government contributions should be prioritised in municipalities where affordability is a challenge. Water services are highly politicised and this makes it difficult for municipalities to promote cost-reflective tariffs required to ensure continued operation and maintenance of the infrastructure.

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APPENDIX 1

Questionnaire for the developing of a conceptual framework for public-private partnerships for local government water infrastructure.

SECTION A: RESEARCH OBJECTIVE NO.001

CONDUCT A COMPARATIVE ASSESSMENT OF ALL THE PPP MODELS TO ESTABLISH SHORT-COMINGS, SUCCESSES, AND SUITABILITY TO CERTAIN ENVIRONMENTS.

A. SUCCESS FACTORS OF PUBLIC-PRIVATE PARTNERSHIP MODELS IN FINANCING WATER INFRASTRUCTURE:

A1. Public-private partnership (PPP) models are successful in financing local government water infrastructure.

Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
<input type="checkbox"/>				

A2. PPP models are appropriate for financing local government water infrastructure.

Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
<input type="checkbox"/>				

A3. Government should promote the use of public-private partnership models in order to fast-track water services infrastructure delivery.

Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
<input type="checkbox"/>				

A4. Government should use public-private partnership models to address the problem of operation and maintenance of local government water infrastructure.

Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
<input type="checkbox"/>				

B. SHORT-COMINGS OF THE PUBLIC-PRIVATE PARTNERSHIP MODELS IN FINANCING WATER INFRASTRUCTURE

B1. In your view, what are the short-comings of the PPP models in financing local government water infrastructure?

.....

.....

B2. What are regulatory or legislative obstacles that can derail financing of local government water infrastructure through PPP models in South Africa?

.....

.....

B3. What are socio-political issues that can derail financing of local government water infrastructure through PPP models in South Africa?

.....

.....

B4. What are economic factors that can discourage use of PPP models in financing local government water infrastructure through PPP models in South Africa?

.....

C. SUITABILITY OF PUBLIC-PRIVATE PARTNERSHIP MODELS FOR FINANCING WATER INFRASTRUCTURE

C1. Public-private partnership models are appropriate vehicles for financing water infrastructure during *difficult economic conditions*.

Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
<input type="checkbox"/>				

C2. Public-private partnership models are appropriate vehicles for addressing *operation and maintenance* of local government water infrastructure.

Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
<input type="checkbox"/>				

C3. Public-private partnership models are appropriate vehicles for addressing institutional challenges required to ensure continued maintenance of local government water infrastructure.

Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
<input type="checkbox"/>				

C4. Public-private partnership models are *socially acceptable models* for financing local government water infrastructure in South Africa.

Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
<input type="checkbox"/>				

SECTION B: RESEARCH OBJECTIVE NO.002

CONDUCT AN ASSESSMENT ON VARIOUS CONTRACTUAL ARRANGEMENTS BETWEEN PRIVATE AND PUBLIC INSTITUTIONS INVOLVED IN THE PPP MODELS.

D. What are the types of PPP contractual arrangements that you are aware of in Gauteng and Limpopo Provinces?

.....

.....

.....

D1. Contractual arrangements for PPP models that I am aware of are yielding desired results or objectives.

Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
<input type="checkbox"/>				

D2. In your view, what should inform contractual arrangements for PPP models in financing local government water infrastructure?

.....

.....

.....

D2-1 Contractual arrangements for PPP models in Limpopo and Gauteng Provinces are taking into account all key variables which can affect the effectiveness of PPP models?

Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
<input type="checkbox"/>				

D3. How are the existing PPP contractual arrangements managed?

.....
.....
.....

D4. What are the minimum and maximum duration of the existing PPP contractual arrangements?

.....
.....
.....

D5. How effective are the dispute resolution mechanisms for PPP models in the water sector?

.....
.....
.....

SECTION C : RESEARCH OBJECTIVE NO.003

REVIEW FINANCING ARRANGEMENTS OR STRUCTURES THAT HAVE BEEN PUT IN PLACE TO GUIDE PPP MODELS IN LOCAL GOVERNMENT WATER INFRASTRUCTURE

E. What types of financing arrangements are designed to support PPP arrangements in the Gauteng and Limpopo Provinces?

.....
.....
.....

E1. Financing arrangements for PPP models that I am aware of are yielding desired results and objectives.

Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
<input type="checkbox"/>				

E2. In your view, what should inform financing arrangements for PPP models in financing local government water infrastructure?

.....
.....
.....

E2-1 Financing arrangements for PPP models in Limpopo and Gauteng Provinces are taking into account affordability and revenue flows which can affect the sustainability of PPP models.

Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
<input type="checkbox"/>				

E3. How are the finances of the existing PPP arrangements managed?

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E4. What are the minimum and maximum monetary values of the existing PPP arrangements in the Limpopo and Gauteng Provinces?

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.....

.....

E5. Water sector PPP arrangements are attractive to investors and financiers.

Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
<input type="checkbox"/>				

SECTION D : RESEARCH OBJECTIVE NO.004

DETERMINE KEY VARIABLES THAT SHOULD INFORM THE DEVELOPMENT OF A COST-EFFECTIVE PPP MODEL TO ENSURE LONG-TERM SUSTAINABILITY OF LOCAL GOVERNMENT WATER INFRASTRUCTURE

F. What are the primary variables that should inform the structure of the PPP models in the Gauteng and Limpopo Provinces?

.....

.....

F1. The above-mentioned variables are taken into account in the current PPP models.

Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
<input type="checkbox"/>				

F2. In your view, what are the key variables that should be considered when structuring PPP models in financing local government water infrastructure?

.....

.....

F2-1 The current PPP models that I am aware of are cost-effective and financially sustainable.

Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
<input type="checkbox"/>				

F3. The existing PPP models are economically viable.

Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
<input type="checkbox"/>				

F4. The current PPP models that I am aware of are socially and politically acceptable.

Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
<input type="checkbox"/>				