

## RESEARCH ARTICLE

## EXPLORING THE EMPIRICAL EFFICACY OF PREPAID WATER METERS IN A FAILED STATE, A CASE OF HARARE IN ZIMBABWE

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## ABSTRACT

This study espouses the diverging interpretations on the essence and effectiveness of prepaid water meters with households who are explicitly citing that the tools do not effectively strike a balance between social parity and institutional sustainability in a failed state. 271 structured questionnaires were administered to Harare residents in enabling the provision of a measurement of the resident's perceptions regarding the water metering system and descriptive statistical analysis was used to determine the results. Ten interviews were also conducted with key informants based on their expertise as the service providers. Two focus group discussions with two of the civil water organizations that are crucial catalysts between the Harare City Council and Harare residents were conducted. The findings of this study concluded that the effectiveness of prepaid water meters will only be successful with due reflection on all-encompassing stakeholder engagement and pro-poor approaches for sustainable service provision.

## KEYWORDS

Failed State, Service Delivery, Sustainable Development, Potable Water, Prepaid Water Meters, Pro-Poor; Water Governance

## 1. INTRODUCTION

The effectiveness of prepaid water meters is defined through a variety of platforms, hence, researchers posit that a prepaid water meter is a definitive cost retrieval tool which can execute the computation of water volume used to coerce users to pay for that exact amount (McDonald, 2002; Combine Harare Residents Association (CHRA), 2015; UNICEF, 2016; UNDP, 2015). While others assert that prepaid water meters (PPWM) enable service providers to evade the costs aligned to non-payment and debt accrual because the water meter valve automatically shuts down when credit is exhausted (Swyngedouw, 2006; Majuru et al., 2011; Chirenda et al., 2015; Chigumira and Mujere, 2009). However, McDonald (2002); Matabvu (2016) applaud prepaid water meters for being the most appropriate system that promotes payment of services to ensure efficient revenue collection as opposed to conventional water meters which deliver water. Essentially this study addresses the extensive question of the empirical efficacy of the prepaid water meters through the citizen's lenses by striking a balance between the Human rights-based approach and the systems theory in meeting the potable water needs of the Harare residents (McDonald, 2002; Matabvu, 2016).

This study espouses the diverging interpretations on the essence and effectiveness of prepaid water meters on households, with some citing that the tools do not effectively strike a balance between social parity and institutional sustainability (Maphela & Cloete, 2019; Mudzingwa, 2015; Gamba, 2013; JMP, 2017). Harvey (2005); Marvin *et al.*, (1999) cite that prepaid water meters have no other exceptional merits over conventional water meters other than the presumptuous hopes of revenue accrual (Harvey, 2005; Marvin *et al.*, 1999). Previous studies affirm that prepaid water metering transfers accountability to residents who are left at the expense of the metering system which can disconnect them when they fail to recharge, but ensuring potable water is saved (Abu-Hilou and Jarrar,

2012; Matabvu, 2015; Berg and Mugisha, 2010).

However, this study maintains that if revenue accrual is the main objective for the Harare City Council, then its priority target for PPWMs should be the predominant users of bulk water, such as major industries, government, and commercial entities rather than domestic users who are yielding into the socio-economic crisis in Zimbabwe. Hence, it becomes imperative to understand these realities empirically and as a result, this study questions why the Harare City Council would advance prepaid water meter implementation, which has already been forbidden in the United Kingdom, Palestine, India, and Namibia among other countries due to their adverse socio-economic effects (Mapedza & Geheb, 2010; WHO, 2015; OFWAT, 1998; Abu-Hilou & Jarrar 2012). It is significant to note that the crux of this study is not to totally disregard prepaid water meters as being anti-poor or punitive, but however to acknowledge that their effectiveness can be fully exploited with adequate support and full understanding by the public as underpinned by the Human Rights Based Approach to water.

It becomes essential to note that while assessing the effectiveness of prepaid water meters, a pro-poor outlook would strike an equitable balance. This is because Fact sheet number thirty-five of The United Nations establishes that the right to water has freedoms and entitlements (UNICEF, 2016; UN-Habitat, 2009). The freedoms include being free from capricious disconnections and entitlements necessitate access to a minimum amount of potable water (Swyngedouw, 2006). Additionally, studies note that prepaid water metering has been increasingly gaining impulse in developed nations and the experiences in developing nations are not so plausible (Shepherd, 2004; GOB, 2012; Matabvu, 2016). Thus, the implementation of prepaid water meters in Harare without apt consultation from the public could be a limiting factor in fully enabling their effectiveness (Chirenda et al., 2015; Kayaga, 2008). Simultaneously, this study affirms that Harare residents will be involuntarily coerced to

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use the amount of water they can afford as opposed to their needs thus eroding the core of humanity due to affordability. Given the continuous scholarly debates on prepaid water meters by different scholars, especially within the context of goal six of the sustainable development goals of 2030 which emphasizes that all developing nations must achieve

universal and equitable access to safe and affordable drinking water. Hence, the aim of the study is to explore the empirical efficacy of prepaid water meters in ensuring access to potable water provision in Harare a city in Zimbabwe, a country which has been catalogued a failed state (Nhema & Zinyama, 2016).

| Table 1: Link between research questions to sources and methods justification   |  |  |
|---|--|--|
| Research Question   | Source and Methods   | Justification  |
| 1. To identify the perceptions of the Harare residents regarding the effectiveness of prepaid water meters for service provision.                         | -Questionnaires<br>-Focus Group Discussions                              | - It enabled the provision of a measurement of the perceptions of the residents.<br>-They provided in-depth information on the perceptions of the resident's views |
| 2. To investigate the technical capacity of the Harare City Council authorities in providing potable water to the residents through prepaid water meters. | -Key informant interviews  | - They aided in understanding the technical capacity of the Harare city council to provide potable water through prepaid water meters.                             |
| 3. To explore and recommend the appropriate alternative strategies for potable water provision in Zimbabwe.   | -Questionnaires<br>-Focus Group Discussions<br>-Key informant interviews | -A summation of all the findings was used to explore and recommend on alternative sources of potable water provision   |

**2. UNDERSTANDING THE CONTEXT OF PREPAID WATER METERS IN HARARE**

This study understands that prepaid water metering is a system which ensures that users pay an amount of money that is precisely equivalent to the amount of water they will use. This means that prepaid water meters inhibit access to potable water services when a user exhausts their credit or prepaid balance, thereby limiting and denying potable water consumption. Thus, Mudzingwa (2015); Drakeford (1998); BMA (1994) echoed the sentiments that prepaid water meters are water controlling apparatuses which are powered by an expensive technology that is intentionally implemented to coerce payment for potable water services. Of principle to this study, is that the Zimbabwe Electricity Supply Authority Holdings (ZESA) begun rolling out prepaid electricity meters since 2011 to recoup lost revenue. In similar fashion, the Harare City Council began a roll-out of prepaid water meters since 2016 to recoup lost

revenue incurred through non-payment of services by residents.

Research defined prepaid water meters as complex, automated, and technologically driven devices which are constructed from different metal and plastic material which permit the discharge of potable water based on payment or non-payment see picture 1 below (Gambe, 2013; Berg and Mugisha, 2010). Conversely, Mudzingwa (2015); Matabvu (2016) affirm that prepaid water meter implementation has been contentious in Zimbabwe even prior to its implementation with residents citing that the new tools are an impartial technology which is simply meant to benefit the service provider. It is against this background that this study argues that potable water can never be placed on an equal scale with electricity due to the human right to water and the various sustainable development entitlements aligned (Mudzingwa, 2015; Matabvu, 2016). However, this does not imply that potable water should be merely distributed free of charge, what this means is that it should always be available as a rudimentary need, not a lucrative service.



Figure 1: Prepaid water meters in Mabvuku, Harare

Source: (Maramura, 2018)

Zimbabwe's cataloging as a "failed state" is undeniable because the country has been ranking number 16 on the Global Foreign Policy's Failed States Index since 2016 after scoring 100.5 (Nhema & Zinyama, 2016). Thus, classification of Zimbabwe as a "failed state" implies that a greater population of the Zimbabwean populace is surviving below the poverty datum line (Nhema & Zinyama, 2016; OECD, 2017) thus the sustainable provision of potable water should then remain a crucial element for the achievement of SDG 6. This is a factor to reflect on given the population of the Harare residents that is succumbing to great intensities of unemployment and abject poverty (Demographia World Urban, 2016). The current socio-economic status, therefore, poses complications for residents in pre-recharging the meters thereby limiting the effectiveness of these prepaid water meters whose main objective is revenue accrual. It is against this background that, (Hove and Tirimboi, 2011; Mapedza and Geheb, 2010; Maramura, 2018) acknowledge that the public service provider should use technology without permitting it to take control over humanity, socio-economic development, or sustainable development. Musingafi and Chadamoyo (2013) confirm the initial aim of prepaid water meter implementation was to ensure cost recovery by the Harare City Council, but (Maramura, 2018) further argues that the approach has totally disregarded the public which was not adequately consulted on the efficacy of the devices (Musingafi and Chadamoyo, 2013).

This study emphasizes that the effectiveness of prepaid water meters lies in its economic practicality, operator responsiveness and its receptiveness by the public, all of which is absent in this context. Hence, it becomes significant to note that prepaid water meters are not solely "magical sticks" that have the clout to address causative underlying potable water challenges (Heymans, Eales & Franceys 2014; Oxfam, 2011). This is because economic practicality is also a key factor in determining the effectiveness of prepaid water meters which are very costly, attracting a price range of US\$400-US\$550 per meter (Matabvu, 2016:4). The argument of this study is that the public is not simply fascinated by a new and pricey technology, but they are more concerned about the efficient delivery of potable water services which are affordable, accessible, and reliable.

**3. TRANSITIONING FROM NON-PAYMENT TO PREPAYMENT: A LIBERAL MOVE OR PUNITIVE MOVE**

Studies assert that the essence of potable water on humankind is significant such that its unavailability can result in the instability of life which can ultimately lead to death from water-borne diseases (Maphela & Cloete, 2019; UNDP, 2013; OXFAM, 2011). Developing states have been

yielding to service delivery fragmentation as inherited from past colonial rule which did not represent sustainable socio-economic service provision patterns (Mapedza and Geheb, 2010; Machingautu, 2010). Likewise, most developing nations have been constantly failing to ensure access to effective potable water supply and Zimbabwe has unfortunately not been exempted from this crisis (Chatiza, 2016; OECD, 2006; GOB, 2012; JMP, 2017; UNDP, 2006). The challenges to ensuring effective potable water supply have been so palpable such that goal six of the SDGs of the Post-2015 Agenda posits that “developing and developed countries should ensure the availability and sustainable management of water and sanitation for all by 2030” (WHO, 2015; JMP, 2017). Goal six of the SDG’s further emphasizes that all developing nations must achieve universal and equitable access to safe and affordable drinking water for all by 2030.

This is a distinct reflection on the significance of potable water supply on the everyday lives of humankind. Similarly, Matabvu (2015) acknowledges that the “scourge” of capitalism has necessitated the implementation of prepaid water meters in Zimbabwe, and it is clear-cut that low-income households are always the hardest hit by the socio-economic effects from this transition (Matabvu, 2015). In addition, the Harare City Council is assuming that residents have sustainable incomes and available money at their disposal (Mudzingwa, 2015), even when statistics reveal Zimbabwe has been ranking number 16 on the Global Foreign Policy’s Failed States Index of 2016 with a score of 100.5 (Nhema & Zinyama 2016). Likewise, this study confirms how the Harare City Council is placing high hopes on revenue accrual and discounting the harsh socio-economic effects of prepaid water meters on the public especially from low-income households, citing that they should resort to other sustainable ways (Nhema & Zinyama 2016). Hence, the argument of this study that coercing low-income earners to prepay for potable water supply without any alternative source for them is explicitly harsh and borderline irrational.

#### 4. RESEARCH DESIGN AND METHODOLOGY

Rosnow and Rosenthal (2008:74) acknowledge that qualitative research encourages an interpretation of sense, acquaintance, and observations. Kumar (2005) defines quantitative research as an inquiry of a phenomenon enabled by investigating a concept that can be measured arithmetically and evaluated statistically. The study utilized the pragmatic research philosophy by means of connecting both qualitative and quantitative ontological and epistemological interpretations to address the research questions by using key-informant interviews, focus group discussions and questionnaires (Kumar, 2005). This study was advised by the mixed method approach in integrating both qualitative and quantitative research instruments. Leedy (2005) maintains that triangulation in research can support the researcher to depict an objective analysis of the data and findings of the study. Hence, triangulation enabled the author to dissect the research from diverse angles (Leedy, 2005).

| DESIGNATION OF RESPONDENTS          | TARGETED RESPONDENTS | INSTRUMENT               | ANALYSIS        |
|-------------------------------------|----------------------|--------------------------|-----------------|
| Harare City Council authorities     | 10                   | Key Informant Interviews | Thematic Coding |
| Civil water organizations officials | 20                   | Focus Group Discussions  | Content         |
| Harare residents                    | 271                  | Questionnaires           | SPSS            |
| Total Target Population             |                      | 301                      |                 |

##### 4.1 Experiment Environment

The City of Harare has a land expanse of 872 square kilometers and the (Census, 2012) had projected a population of approximately 1 800 000 people in 2015 and the (UN Habitat, 2009) anticipated that the figure would rise by 3.54% on an annual basis to 2 337 000 people by 2025. Likewise, Demographia World Urban (2016) confirms that the average total population of Harare is 2 123 132 people out of the 13 061 239 of the population of Zimbabwe. The current potable water supply structure has six thousand kilometers of cast iron pipes water and as of 2012, only 200 kilometers of these cast irons pipes had been overhauled with polyvinyl chloride pipes which are cheaper, of lighter weight and not corrosive (CHRA, 2015). The cast iron pipes are more vulnerable to damage since they are easily corroded due to ground expansion and shrinkages during the rainy period and after the rainy periods (Nhapi, 2009). Consequently, due to their corrosive component, these cast iron pipes have been gradually succumbing to dilapidation which is, unfortunately, leading to non-revenue potable water from burst water pipes (Nhapi, 2009).

Hove and Tirimboi (2011) also reiterate that Harare City Council yields to non-revenue potable water of about 40% to 50%, which has adverse effects on the already palpable potable water challenges. Harare City Council’s potable water infrastructure was fundamentally intended to supply an average population of 350 000 people, (Census, 2012) espouses that through sizable amounts of restructuring the system can now supply potable water to only 1.5 million people. This implies that due to overpopulation, the potable water needs of over a million surplus residents are not being met by the decrepit infrastructural structures in its current capacity (Chirenda, et al., 2015). Thus, the argument of the study that the Harare City Council should consider factoring in servicing and maintaining the old infrastructural system, which is currently overwhelmed, before introducing a new complex infrastructure in the form of prepaid water meters.

##### 4.2 Case Study Sample, Survey Approach and Data Analysis

The qualitative research method prompted the author to use purposive sampling to select the key informants from the Harare city council authorities who managed the prepaid water metering implementation process. Purposive sampling was also used in selecting the participants from civil water organizations because they are the catalysts between the Harare residents and the Harare City Council authorities. Face to face and telephonic key informant interviews with ten Harare City Council officials were undertaken to understand their technical capacity in providing alternative adaption strategies of potable water provision to the residents. Two focus group discussions, with each group consisting of ten participants, were held under the guidance of a moderator. Content analysis was used to analyze the focus group discussions and the interviews because it gave a presentation of data. Thematic analysis was ultimately used in discussing the common and recurrent themes from the data gathered.

Quantitative research enabled the author to use systematic sampling in selecting the Harare residents because it adopts simple random sampling at the beginning to establish a sampling interval which creates a quasi-random selection method. The author identified the first respondent from the Harare City Council registry and the remaining residents were selected using the sampling interval of the 5th element of the whole population from the Harare City Council registry. The estimated representative sample size for the survey was derived from the Raosoft sample size calculator for the maximum variability of the sample based on the population of Harare (Raosoft, 2004). 271 structured questionnaires were self-administered to Harare residents because questionnaires are most appropriate when establishing a relationship between variables when there is a large sample involved. The author used descriptive statistical methods through SPSS to analyze the findings of the study as gathered from the structured questionnaires that were administered to the residents.

##### 4.2.1 Validity and Reliability of the Quantitative Data

Validity was enabled in this study, through the adoption of Harare as a case study and Newman and Benz (1998:66) affirm that, “adopting case studies increases validity because they reflect on different but significant acumen by reflecting on the efficacy of prepaid water implementation”. Reliability, according to Bak (2004) is the extent to which a scale produces consistent results if measurements are made repeatedly on the same characteristics. The author took measures that helped reduce the measurement error by asking consistent questions to respondents and reducing coverage errors by including three target populations.

##### 4.2.2 Trustworthiness and Credibility of Qualitative Data

Credibility in qualitative research is closely comparable to validity in quantitative research. Furthermore, qualitative research acknowledges how the social phenomenon can be elucidated on through numerous accounts as derived by the researcher. Hence, Bryman (2015) expounds on how harnessing more than one data collection tools enables an improvement in the credibility of the study in warranting respectable practices in qualitative research. Subsequently, the author also took adequate action which warranted credibility of the study by employing key informant interviews, focus group discussions and an extensive literature study in comprehending the efficacy of prepaid water meters for potable water provision (Bryman, 2015).

#### 4.3 Results

The study established the gender, age, household size, occupation, marital status, and property ownership of the residents within each residential area surveyed in Harare, as essential variables in exploring the empirical efficacy of prepaid water meters in a failed state.



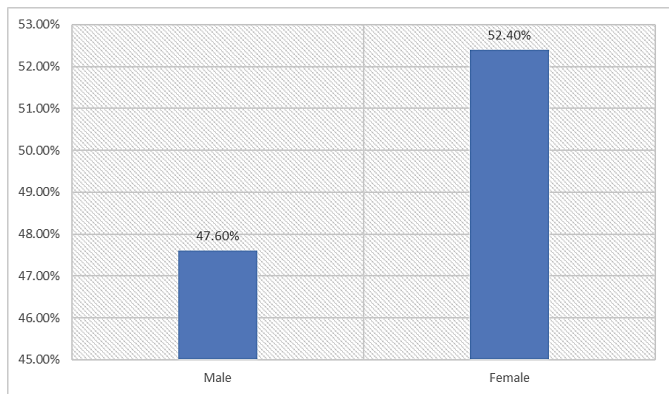


Figure 2: Age Distribution

The study established that of the 271 respondents that participated in the survey 52, 4% were females and only 46, 7% of those respondents were males. It is essential to highlight that gender dynamics are critical to this study because (WHO, 2015) confirms that, women and girls in the African context are responsible for ensuring the availability of potable water for the household as compared to men.

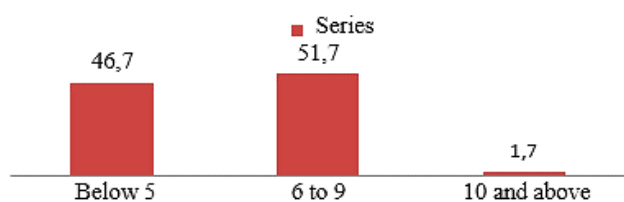


Figure 3: Household size

The study results reflect that 46, 7% of the respondents live in a household which has less than 5 occupants, whilst 51, 7% of the respondents live in a household which has a minimum of 6 occupants and only 1, 7% of the respondents live in a household which has more than ten occupants. This is meant to give insight into the socio-economic dynamics of the sampled Harare residents in the context of a failed state (CHRA, 2015). Understanding these socio-economic dynamics also enables a clear reflection of the efficacy of prepaid water meter implementation for potable water provision in the Harare City Council.

Furthermore, given the current socio-economic condition in Zimbabwe, the study established that 53, 6% of the respondents are formally employed and this does not imply that they have direct access to money by reflecting on the cash crisis and high rates of inflation which are prevalent in Zimbabwe. Nhema & Zinyama (2016) confirms residents of Harare earn their income in Zimbabwean bond notes, while the prepaid water meters will be charged in US Dollars which defeats the purpose, because it limits their access to surplus cash. Out of the 271 respondents that participated in the survey 33, 5% are unemployed and only 12, 8% noted that they are self-employed which means they have other unconventional means of income. These demographics are significant because if 33, 5% of the population sampled from is unemployed this implies that they will struggle to access money to make payments before accessing potable water as the study argued.

#### 4.3.1 Perception of Residents Towards Post-Paid Meters

Chaminuka and Nyatsanza (2013); Chatiza (2016) affirm that equitable access to potable water supply should be at least rationed as twenty liter's or more per individual within the household and it should be accessible from within one kilometer of the household. The UNDP Human Development Report (2006:65) also asserts that the WHO and the UNDP advocated that, "every person has a human right to a minimum of about twenty liters each day in terms of establishing social minimum provision levels". Unfortunately, interviews from the study indicate that, a greater population within Harare presently do not have access to potable water supply, such that they store water in various household utensils like buckets and pots (Chaminuka and Nyatsanza, 2013; Chatiza, 2016). Gambe (2013) also confirms that, most of this water is stored for lengthy periods of time because it is gathered in vast amounts to cut out on collection time. As a result, the potable water is either contaminated or discolored when it is used (Gambe, 2013). Nhema and Zinyama (2016) acknowledge that this is an indicator of the failure of the Harare City Council in ensuring residents have access to potable water supply even with the post-paid meters (Nhema and Zinyama, 2016).

Hence the residents would be justified in refuting the prepaid water meters since the Harare City Council is presently failing in ensuring adequate piped water supply to the residents and there is no guarantee in administering prepaid water meters. The empirical findings reveal that residential areas in Harare do not have access to piped potable water supply and as a result, they have resorted to conventional and unconventional sources of potable water supply (Mudzingwa, 2015). The Harare City Council has failed the residents as a service provider even with the post-paid meters such that the effects have a greater ripple effect on women and girl children who bear the brunt of household water collection for lengthy periods (Nhema & Zinyama, 2016; Majuru et.al, 2016). Evidence from the study reveal a dissatisfaction with post-paid water meters because residents must wake up very early or sleep very late to ensure a daily household supply of potable water is secured from the few sources such as water merchants, boreholes, or shallow wells. In high-density areas within Harare such as Budiriro, Mufakose, Mabvuku, Glenview, and Glen-Norah, women must wake up before 3 am to catch-up with the long-winding queues at the communal boreholes (World Bank, 2019; Mangizvo & Kapungu, 2010).



Figure 4: Current sources of potable water provision

Source: Adapted from (CHRA, 2015)

A greater population of the Harare residents rely on boiling water or disinfecting it through filtration or using water disinfectants. Empirical evidence from this study shows that, out of the total respondents, 31.8% disagreed and 22.7% agreed on the satisfaction with post-paid water meters. Thus, the study revealed that 50% of the Central Business District (CBD) residents agreed to be satisfied followed by 25% of the CBD residents who disagreed and strongly disagreed respectively. 29% of the low-density residents strongly agreed to be satisfied with the post-paid meters followed by 25.6%, 23.1% and 17.9% of the low-density residents who strongly agreed, agreed and were not sure respectively. In the medium density areas, 27.7% of the residents disagreed with being satisfied with the post-paid meter. This was followed by 24.6%, 20% and 15.4% of the medium density residents who strongly disagreed, agreed and were not sure respectively. Likewise, 38% of the high-density area residents disagreed with being satisfied with the post-paid meters. This was followed by 23.5%, 19.1% and 16.2% of the high-density residents who agreed, strongly agreed, and strongly disagreed respectively to the satisfaction of post-paid water meters.

A Harare Residents Trust Official noted that:

*"PPWM's do not work well because they have a lifespan of 3-5 years which is very short as compared to the conventional meters. The fixed payment is better than prepayment in the context of Zimbabwe going downhill, and electricity is a luxury, but water is a human right? It will expose us to water-borne diseases because of the dynamics surrounding prepayment. They should restructure the fixed system so that we get water than employing an infrastructure that will not increase the water supply."*

A Harare City Council Official indicated that:

*"From those involved in the PPWM pilot project, positive comments are emanating because residents can now budget and account for water usage as compared to conventional meters. Some are still skeptical due to fear of the unknown."*

Citizen's perceptions point to the susceptibility to malfunctioning of PPWM's due to a limited lifespan in contrast to the post-paid meters, which implies they need constant servicing and maintenance, and the financial burden will always trickle down to the residents (Thompson & de Wet, 2013; Harvey, 2005). Residents also argue that in the context of Zimbabwe as a failed state PPWM's are not sustainable because water is a human right and citizens will be affected when they do not have credit, which will expose them to water-borne diseases (WHO, 2015; UNICEF, 2016). From

the findings, the residents ultimately confirmed that PPWM's will tear the social fabric apart, hence the Harare City Council should restructure the existing system and ensure constant potable water supply to meet the water demands before implementing PPWM's because PPWM's will certainly not guarantee water supply. However, the study gathered that some of the residents are receptive of the PPWMs because they will permit them to plan, budget and account for their potable water usage; however, some residents are still skeptical on the efficacy of prepaid water meters for potable water provision.

### 4.3.2 Citizen's Perceptions Towards Prepaid Water Meters

Prepaid water metering essentially entails that, payments for potable water services is done before receiving the supply of potable water whilst post-paid metering entails paying for services monthly after consumption (Mudzingwa, 2015; Chatiza, 2016; Heymans et al., 2014). Thompson and de Wet (2013) acknowledge that post-paid meters are plausible in providing an allowance of non-disconnection for low-income households that fail to pay for services, because they still get access to potable water supply without prepaying. However, Matsinhe et al., (2014) cite that, post-paid meters have the downside of creating ignorance to the essence of payment for services as a responsible citizen and this ultimately leads to debt accrual, which the Harare City Council is succumbing to.

It is against this background that the study argues that, given the socio-economic status of Zimbabwe, not everyone will be able to prepay and thus the resident will be inhibited from the potable water supply until they recharge again. Xie (2006) also notes that the predicament is that prolonged periods of absence of potable water supply have a direct effect on the quality of water when it is ultimately delivered because it becomes contaminated or unsafe for consumption because the pipes will be idle (Xie, 2006). Thus, CHRA (2015); Chirisa (2013); Mudzingwa (2015) maintain that prepaid water meters are arguably complex and more technical than post-paid water meters, which makes the former much more susceptible to malfunctioning. Hence, this study notes that the empirical efficacy of prepaid water meters is highly dependent upon a lot of factors which cannot be easily cultivated by the Harare City Council given the socio-economic status of the country (CHRA, 2015; Chirisa, 2013; Mudzingwa, 2015). This study is certainly not meant to disregard the effectiveness of prepaid water meters, but it is imperative to factor in the dynamics that surround prepaid water metering in comprehending the efficacy of prepaid water meters for sustainable potable water provision as graphically captured below.

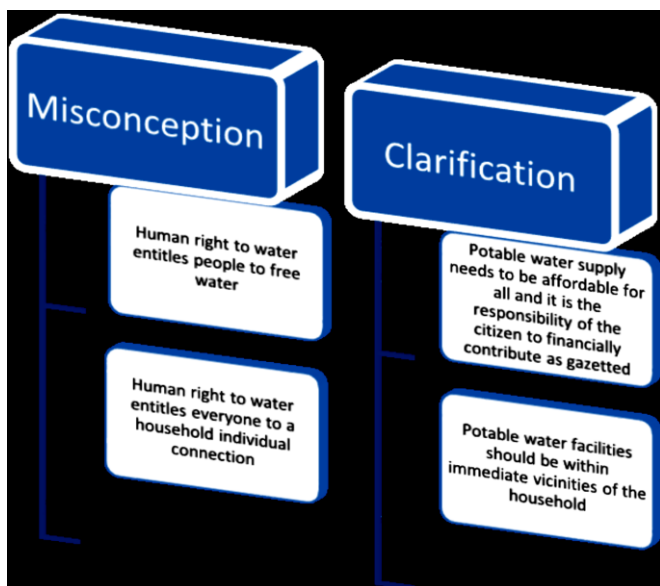


Figure 5: Misconceptions and Clarifications of the HRBA

Source: Adapted from (UN Human Development Report, 2006)

Resultantly, of the total 271 respondents that participated in the survey, 35.2% agreed as well as 25% who strongly agreed to the effectiveness of PPWM's over a post-paid meter. The study reveals that most of the respondents that strongly disagreed with prepaid meters being more effective over post-paid meters were from medium density areas with 66.7%. This was followed by 87% of the high-density residents who disagreed and 48.6% of the high-density residents who were also not sure of the effectiveness of the PPWM's over the post-paid meters. Most of the respondents who agreed to PPWM's being more effective than post-paid

meter were from low-density areas with 35.5% of the residents confirming this and those who strongly agreed were from the medium density areas 47.7% as highlighted below.

A CHRA Official noted that:

*"PPWM's will not efficiently meet the potable water needs of the Harare residents because they will not guarantee quality water provision and we need to understand that it does not change Lake Chivero as the raw water source. Hence it is nonsense that PPWM's will efficiently meet potable water needs because they are just an extension of the corrupt system."*

A Harare Residents Trust stated that:

*"PPWM's will not meet the needs because even the fixed system does not deliver to everyone, and it will worsen the present situation. What about the low-income residents, women are already disadvantaged with the current water shortages?"*

Feedback from the research participants comprehended that PPWM's will unfortunately not meet the potable water needs of the residents because PPWM's do not change the source of raw water, rather they only change the methods of payment. Hence the residents dispute the effectiveness of PPWM, citing that they are simply an expensive extension of the corrupt City Council. As argued by (Musingafi & Chadamoyo, 2013), the study also reveals that there is mistrust between the residents and the City authorities because the residents perceive the latter to be corrupt and inefficient because they are misdirecting their focus as service providers into profit makers. The resident's associations cited a plethora of challenges that are currently underpinning the City Council which cannot inexplicably transform the potable water system by implementing PPWM's. The argument is that they should redirect their focus to ensuring quality and effective service provision then capitalize on profit making when there is customers satisfaction (Murungweni, 2013; Chirisa, 2013).

Chatiza (2016); Matabvu (2016) argue that the effectiveness of PPWM's is still yet to be realized, considering there is a simpler conventional system that has been slowly dilapidating due to failure to restructure by the city council for the past forty-three years. The residents also argue that PPWM's will only change the billing system and the source and means of water supply will remain the same. Thus, the effectiveness of PPWM's accordingly becomes inexplicable, because if the Harare City Council is failing to sustain a simpler post-paid meter, hence what guarantee is there that it will be effectual in ensuring the effectiveness of the complex PPWM's (Chatiza, 2016; Matabvu, 2016).

This confirms the hypothesis of this study that residents have a negative perception towards the efficacy of PPWM's for potable water provision. It is essential to note that PPWM's will not change the potable water quality, which residents already argue to be smelly, dirty, and discolored (Chirenda et al., 2015; Majuru et al., 2016). Thus, the respondents cited that even if the PPWM's were to be effective, the city council is not cooperative due to endemic corruption, so prepaying for water will be promoting corruption. This means that the effectiveness of the PPWM's will not be fully exploited because residents argue that they will not pay thereby affecting the cash flow system of the Harare city council.

A Harare City Council Official highlighted that:

*"In terms of revenue collection, PPWM's will be more effective because if you do not pay you do not get water but let us not forget this will also have the downside of thrusting residents into unhealthy and alternative sources of water."*

Another Harare City Council Official indicated that:

*"Yes, they will be effective since the user pay principle brings a sense of belonging which leads to a dramatic reduction in gross abuse and wastage."*

Results from the study also espouse that, the Harare City Council acknowledges the effectiveness of PPWM's over post-paid meters in terms of revenue collection since there is an element of coercion to pay to access potable water supply. Nonetheless, the city council also noted the challenges that might arise for households that are unable to purchase water since they will be forced to resort to unsustainable means, thereby creating adverse effects relating to water-borne diseases outbreak (Chatiza, 2016; Chikozho, 2006). The study comprehended that; the city council anticipates that PPWM's will effectively operate against all odds. However, this study would like to note that the city council is solely focused on the element of revenue accrual and ignoring the empirical efficacy of the PPWM's if residents do not actually pay for the services, given the dilapidated economic state of Zimbabwe.



## 5. IMPACT OF CONSUMER CONSULTATION ON THE SUCCESSFUL IMPLEMENTATION OF PPWMS

Proponents of prepaid water meters maintain that, ensuring revenue accrual will enable the service provider to reinvest in the restructuring of the potable water system, which is ultimately beneficial for the public (Bakker, 2012; Bond, 2002). While Nhema & Zinyama (2016) argue that prepaid electricity implementation has propagated prepaid water implementation due to the success in revenue accrual. However, this study continuously argues that equating electricity to potable water is irrational because electricity is a want and potable water is a basic need that is constitutionally grounded (Constitution of Zimbabwe, 2013). This study explicitly declares that prepaid electricity metering should never be placed on the same scale with prepaid water metering, and this could also be the reason why prepaid water metering has not registered as much success stories and some countries have totally banned them (Drakeford, 1998; OFWAT; 1998; BMA, 1994).

## 6. RECOMMENDATIONS

The study establishes that PPWM's will not necessarily promote payment, but they will coerce residents to pay for a service whose quality they are not even certain of. This reflects on the significance of consultation and public participation in the service provision spectrum to ensure comprehensive stakeholder engagement (International Water Association, 2004; Zhou, 2013; Nhede, 2012). Harare Residents Trust disclaims the promotion of payment for water by PPWM's citing that, residents currently do not pay for services because they lack access to water supply because the infrastructure is dilapidated, and the council is inept, so the difference is the same because residents have alternatives. They also argue that the water supply for those who receive it is unclean and beyond human consumption (Nhapi, 2009; Hove & Tirimboi, 2011; Majuru et al., 2016). The Harare City Council should enable capacity investment into the potable water service provision structure. Harare City Council should also facilitate resource efficiency even within the varying dynamics of economic stresses and pressures. Conversely what is generally clear is that without a resuscitation strategy, Harare will continuously endure the risk and adverse effects of more waterborne diseases related illnesses and deaths which impact on the human livelihoods.

## 7. CONCLUSIONS

Based on the findings, this study argues that gender equity, socio-economic development, and humanity can only be cultivated in the framework of ensuring access to sustainable potable water supply. As a result, the public service provider should exercise careful thought, pending prepaid water implementation. In this regard, this study explicitly declares that potable water services do not necessarily have to be delivered for free, but then, certain tariff arrangements can be facilitated based on residential areas or means test approach for each household to ensure sustainability for both the service provider and the residents. Furthermore, this study ultimately concludes that the efficacy of prepaid water meters will only be efficacious with due reflection on all-encompassing stakeholder engagement and pro-poor approaches. Hence the Harare city council should redirect their focus on restructuring the existing post-paid system to ensure that it delivers clean water before focusing on prepayment. This is because the crux of potable water is surrounded by affordability, availability, and accessibility of water, therefore, payment is not a fundamental matter per se in the absence of the abovementioned factors.

## 8. LIMITATIONS OF THE STUDY

Creswell (2003) acknowledges that explaining the limitations in research enables the readers to assess findings and provide opportunities for further research gaps. Thus, no matter how careful researchers plan to conduct different types of studies, limitations exist in all research (Cooper & Schindler 2003:23). While the Harare City Council has several residential areas the research mainly focused on the residential areas which have already piloted the prepaid water meters. Therefore, studies for further research could engage in areas that could enlarge a larger sample with more residential areas.

## 9. WAY FORWARD

Based on the findings and conclusion of this paper, the suggestions for further studies to look at would be possible alternatives to potable water provision considering the HRBA and the systems theory to service delivery in a complex socio-economic environment.

## 10. DISCLOSURE STATEMENT(S)

*I, Tafadzwa Clementine Maramura, the Corresponding Author, declare that this manuscript is original, has not been published before and is not currently being considered for publication elsewhere*

*I, Tafadzwa Clementine Maramura the Corresponding Author, confirm that the manuscript has been read and approved by me as the author.*

A disclosure/conflict of interest statement. If there is no conflict of interest, please state "As the main author I declare that I have no conflict of interest".

*"This work was supported by the University of the Free State for the page fee processing."*

*"This work was ethically approved by the North West University, since it was extracted from the PhD thesis of the author".*

*"The data for this work is also readily available"*

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