

A Cost Recovery Accounting Approach to Water Management and Supply in the Kurdistan Regional Government of Iraq

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ABSTRACT

The study is a cost accounting approach to water management and distribution that seeks to examine the role of cost recovery play in reducing water management and supply problems. The study uses a systematic literature review together with document analysis to uncover and examine the Kurdistan Regional Government's water management and supply issues, motivating and demotivating factors, and water revenue and costs trends. The findings revealed that the Kurdistan Regional Government has a low-cost recovery of 13% including electricity costs and of 37% excluding electricity costs, and this unacceptably calls for the enactment of appropriate local and social measures, and governmental policy adjustments. It was uncovered that sustainable water management and supply require effective incorporation of factors comprising cost recovery, costs, consumers' willingness and ability to pay, water tariff and

fee collection structures, financial management, operational technology, and appropriate institutions. This study's contributions and implications shape and advance sustainability theories and cost accounting empirical studies to improve practical sustainable water management and supply practices used in the Middle East. Insights provided in this study contribute to shedding light on the key aspects governments must adopt to achieve sustainable water management and supply and contribute to the attainment of global sustainability initiatives.

1. Introduction

Water is one of the most vital elements of life whose scarcity threatens both human and animal survival. As it stands, the world has been experiencing severe water shortages and forecasts presume that this will exacerbate in the next 10 to 15 years (UNICEF, 2020). Besides, the World Wildlife Fund (2022) estimates that 2.7 billion people experience water scarcity at least one month a year, 1.1 billion people lack access to water and forecasts that by 2025, two-thirds of the world's population may be facing water shortages.

With increased climate change problems triggering an increase in global warming problems, the quest to achieve global sustainable water supplies seems to be an unattainable task. Following an increase in cases of drought recorded worldwide (Dervishi et al., 2022; Namaki et al., 2022) and drying dams and rivers (Hammond et al., 2022), one can compel governments through water management authorities to look deeper into water management issues. Among the affected countries, water management issues experienced in the Kurdistan Region of Iraq (KRG), are a major force to reckon with and a cause for concern scholars, action groups and governments cannot afford to turn a blind eye. With an estimated population of 6 171 000 million people in 2020 (Jangiz, 2021), about KRG despite the expended government's effort to allocate 4.7 billion dinars to address "technical problems and 7.6 billion Iraqi dinars for drilling 138 water wells (Bechocha, 2022).

Meanwhile, studies on water management are highly confined to non-momentary aspects (Dossou-Yovo et al., 2022; Giupponi et al., 2006; Russo, Alfredo & Fisher, 2014). Thus, they have overshadowed significant loopholes limiting sustainable water management and supply initiatives. With rising water production, maintenance and supply cost problems in KRG risks of continuing to face increased water scarcity problems in KRG are imminent. The major problem underlying the execution of this study is the lack of cost recovery systems and methods essential for controlling costs and ensuring equitable and continued water supply to residents of KRG. Such problems have forced KRG residents to resort to groundwater as a source of water. As such, the KRG government has been blamed for failing to levy rational water prices because of poor water tariff structures (Sulaiman, Hamad & Andrea, 2022), water fee collection problems and bad financial management practices (Yousuf, Rapantova & Younis, 2018). As a result, KRG residents are reluctant to pay for water consumed and thereby, adding a toll on the government’s ability to recover costs incurred in producing and supplying water. Amid such problems, this study argues and proposes a novel idea that by introducing cost recovery systems, KRG will be able to alleviate its water problems. In order to successfully accomplish this task, the study will need to ascertain conditions that favour the best introduction of a cost recovery system in KRG. In line with such observations, this study, therefore, seeks to answer the following questions;

What role does cost recovery play in reducing water management and supply problems?

What are the conditions favouring the effective introduction and use of a cost recovery system in sustainable water management and supply?

The study is vital for understanding water management usage, issues and solutions applicable in the Middle East, especially in countries like Kurdistan that are overlooked by academic studies. Additionally, insights provided in this study contribute to shedding light on the key aspects governments must adopt to achieve sustainable water management and supply and contribute to the attainment of global sustainability initiatives. Therefore, this study’s contributions and implications shape and advance sustainability theories and cost accounting empirical studies with the

aim of improving practical sustainable water management and supply practices used in the Middle East.

2.Literature review

2.1 Theoretical concepts linked to cost recovery

While it is true that the government is a non-profit maximizing entity (Balcan, Sandholm & Vitercik, 2018), operating at either a loss or breakeven point has proved to be irrational as governments are struggling to continuously provide water and other services in a sustainable manner. But questions have not been addressed on both theoretical and practical levels as to whether a minimum level of profit could be allowed to allow sustainable operations and water supply in the long run. Though the profit maximization theorem is not considered in managing public goods (Balcan, Sandholm & Vitercik, 2018), it is advisable in this case and this call for further studies to explore the optimal water tariffs that will guarantee sustainable and continuous water supply to residents. Subsequently, the solution boils down to effective decision-making. Hence, the application of the cost recovery accounting method serves to enhance the government’s ability to make informed decisions regarding the optimal management and supply of water. Besides, the unending risks and uncertainties call for better decisions, especially at a time when water shortages posed by drought, funding and technical problems, low tariff revenue inflows, and other structural imbalances are threatening viable and sustainable water supplies to residents in KRG. Amid such issues, the decision-making theory by Herbert Simon is best applied. According to Chankong and Haimés (2008), the decision-making theory is a theory of how rational individuals should behave under risk and uncertainty. That is, the theory suggests that decision-making means the adoption and application of rational choice for the management of a private, business, or governmental organization in an efficient manner.

There are psychological reasons influencing the application of cost recovery methods in water management that have remained beyond the glimpse of several studies (Bhojwani et al., 2019; Borrego-Marín, Gutiérrez-Martín & Berbel, 2016; Stavenhagen, Buurman & Tortajada, 2018). This mirrors both theoretical and practical

observations that consumers are willing to pay for quality service delivery (Balcan, Sandholm & Vitercik, 2018). This situation in KRG is a testimony to this issue and propositions made by the decision-making theory that an entity's capacity to solve complex problems (water shortages and operational losses) is limited by stress and motivations and other factors (Sulaiman, Hamad & Andrea, 2022). As a result, both individuals and the KRG have been behaving differently because of water tariff risks and supply uncertainties involved. At the core of the theory lies 'satisficing', which is a combination of satisfying and sufficing. It suggests that one should pursue objectives or make decisions that involve minimum risks and complications instead of focusing on maximizing profits. In contrast to classical theorists, Simon suggests that there is never one best course of action or decision (Chankong & Haimes, 2008). It is because one cannot have complete information about something, therefore, there will always be a better course of action or decision.

2.2 The Cost Recovery Accounting Approach

Cost recovery refers to the recovery of the cost of any expense incurred (Smith & Hanson, 2003). Along similar lines, Berbel and Expósito (2020) define cost recovery as an accounting method in which a business only records the revenue it earns from a transaction at the time that the client has paid enough of the invoice that the business has recouped all its costs on the transaction. Subsequently, the cost recovery method refers to the manner an organisation calculates its income while considering all the costs that have not been recovered yet (Bhojwani et al., 2019). There is consensus among academic studies concerning revenue recognition under cost recovery and studies opine that cash payments have to accompany an invoice for a sale transaction to be recognised as income (Borrego-Marín et al., 2016; Smith & Hanson, 2003). This aligns with studies supporting the application of the cost recovery method citing that it is conservative (Berbel & Expósito, 2020; Bhojwani et al., 2019) and works best when there is considerable uncertainty regarding the collection of trade debtors (Smith & Hanson, 2003).

Meanwhile, efforts by academic studies to uncover factors that foster sustainable water supply point to cost recovery, costs, consumers' willingness and ability to pay,

water tariff and fee collection structures, financial management, operational technology, and appropriate institutions as the major driving forces (Russo Alfredo & Fisher, 2014; Smith & Hanson, 2003; Stavenhagen, Buurman & Tortajada, 2018; Sulaiman, Hamad & Andrea, 2022; World Wildlife Fund, 2022). It is an interesting inquiry that all these outlined factors have been practically sidelined in KRG’s water management practices and continue to pose huge challenges to its sustainability initiatives.

A study conducted by Allaire and Dinar (2022), it is revealed that water supply is a social service. This mirrors other studies conducted in developing countries contending the same thing (Bhojwani et al., 2019; Borrego-Marín, Gutiérrez-Martín & Berbel, 2016; Stavenhagen, Buurman & Tortajada, 2018), but the challenge is that KRG is incapacitated to adopt similar initiatives due to a lack of funding. Moreover, Berbel and Expósito (2020) opine that investment in water projects is the key to sustainability but the investment climate in KRG has not been favourable to investors because of political issues. As a result, KRG is forced to adopt a profitable pricing policy to recoup costs incurred in producing and supplying water to residents.

Reynaud (2016) conducted a study aimed at assessing the impact of the full-cost recovery of water services on European households. It was identified that first the price must be affordable to consumers and reflect the state of the economy. Secondly, it was considered that consumers must be willing and able to pay the levied price. The other two conditions called for the development of appropriate water charges and tariff structures, and the effective collection and channelling of funds to their intended uses. Both suggested conditions are highly applicable in KRG which has been confronted with mismanagement of funds, the significant issues of consumers reluctant to pay for water services and a poorly performing economy (Barwari, 2013; Sulaiman, Hamad & Andrea, 2022; Yousuf, Rapantova & Younis, 2018). Meanwhile, at the beginning of the International Drinking Water Supply and Sanitation a decade ago, cost recovery issues have been given little attention (Cairncross & Mundial, 1992). Langford (2005) notes that despite the United Nations preparing a guideline for water charges and regulations, several countries are still yet to adopt such guidelines. With KRG being one of the countries that are still yet to adopt such guidelines, efforts to

ensure that household and industrial water users pay for the incurred cost as suggested by the United Nations (Langford, 2005) are still in infancy. This undermines KRG’s sustainable water management initiatives and is a cause for concern.

Katko (1990) notes that in 1984, it was reached through the consultative conference that individuals living in rural areas should pay water tariffs that are equivalent to operations and maintenance costs. On the other hand, the World Bank argues that costs should be fully covered to generate future resources (Bhojwani et al., 2019). Such contrasting ideas can complicate the adoption of effective solutions capable of easing water challenges.

In a different setting, Berbel and Expósito (2020) contend that solutions capable of easing water challenges are still yet to be established despite the growing number of conferences on cost recovery. There is a strong consensus among studies that cost recovery initiatives in urban areas are a long-term objective and that operations and maintenance costs including replacement of equipment be recovered in the short run (Bhojwani et al., 2019; Borrego-Marín, Gutiérrez-Martín & Berbel, 2016; Stavenhagen, Buurman & Tortajada, 2018). Such consensus follows the World Health Organisation’s (1987) propositions advocating that beneficiaries in rural areas should gradually assume water operations and maintenance costs responsibilities and the long-term replacement of equipment. Therefore, following Bhojwani et al.’s (2019) guidelines on water cost recovery, the following principal elements are suggested;

- Metering and minimizing non-revenue generating water.
- Preventive maintenance.
- Decentralization.
- Community-managed operations and maintenance due to the decrease in the availability of professional and skilled personnel. Additionally, the need to attach huge importance to having a sense of ownership and responsibility among users to enhance their willingness to pay for water services.
- Making sure that water supply costs do not exceed 5% of a standard family’s income.

- Improving the quality of water supply services to enhance customers’ satisfaction and eventually increase their willingness to pay for water services.
- Making water a valuable resource.

2.3. Key Elements of Cost Recovery

It is imperative to note that one of the key factors guaranteeing the success of cost recovery is ensuring that all the pertinent key elements are given due consideration. Hence, by considering these key factors, the KRG stands to be well poised to achieve sustainability in its water management and supply initiatives (See Fig. 1).

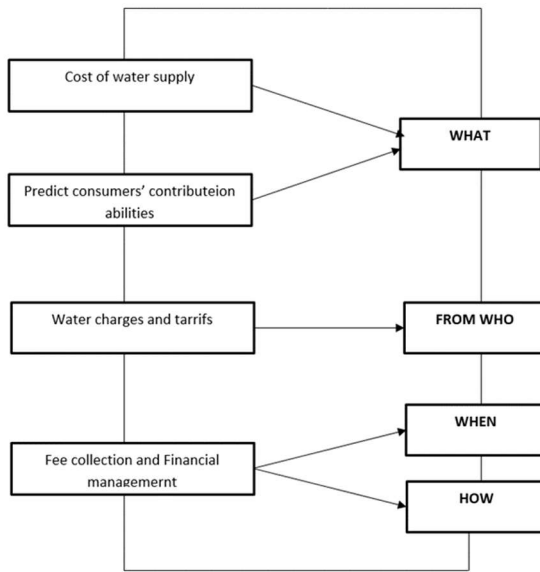


Fig. 1. Key elements of cost recovery (Researcher, 2022)

Amid such vital considerations, studies contend that the key elements should comprise (1) the cost of water supply, (2) the ability to predict consumers’ contribution abilities, (3) the levying of appropriate water charges and tariffs, and (4) proper fee collection and financial management. Incorporating all these key elements should place water management authorities in a better position to address questions related to the what, from whom, when and how

aspects of sustainable water management and supply (Russo, Alfredo & Fisher, 2014). This can be illustrated diagrammatically as shown in Figure 1.

3. METHODS

The study focuses on how cost recovery can be used to address water management and supply problems faced in KRG. The main reason behind this study is that KRG has been facing severe water problems that have been forcing residents to which to groundwater as an alternative source of water supply. Water shortages problems in the KRG have been growing despite it having its main sources of water emanating from surface water sources comprising Upper Zab River, Feshxabur River, Lake Dukar, Lake Darbandixan and Lake Dohuk, and a total of 5500 groundwater deep wells. Additionally, cases of water and financial resources mismanagement are considered to be the major factors causing water scarcity problems faced by cities, villages and districts in the KRG (Sulaiman, Hamad & Andrea, 2022), but no attempt has been done to address such issues, especially by applying a cost recovery approach which is the key to harnessing financial resources required to boost sustainable water management and supply (Yousuf, Rapantova & Younis, 2018). With a growing population reaching as high as 6 million people (Jangiz, 2021), a high influx of refugees from neighbouring countries (Dionigi, 2019), global warming and related climate change problems (Sulaiman, Hamad & Andrea, 2022) and poor economic performance by the KRG economy (Faiq, 2021), the importance of introducing cost recovery to ease its water management and supply problems is highly called for despite few or not attempts to address such issues.

3.1. Approach and Assumptions

The study uses a systematic literature review together with document analysis to uncover and examine the Kurdistan Regional Government’s water management and supply issues, motivating and demotivating factors, and water revenue and costs trends. All the information used in this study was collected from the Directorates of Water in the Kurdistan Region and the General Directorate of water and sewage. Meanwhile, it is imperative to acknowledge that cost recovery is a multi-faceted

concept whose applications rely on the validity of specific assumptions. As a result, basic parameter assumptions were considered for the above-designated water tariffs to effectively contribute to the achievement of successful cost recovery practices. This corroborates Simon’s (2011) insights denote that models are not criticised according to their assumptions but the extent to which they yield the desired results. Therefore, it is vital to acknowledge the following;

- 1) Allocation of land for developing a water treatment plant and storage tanks at no cost and all the other parts of the water treatment plant are not included as part of the calculations.
- 2) Electricity charges or tariffs are included.
- 3) All operations and maintenance costs are included.
- 4) Using the computed cost amount of providing clean water and computing the total cost of providing clean water in the entire Kurdistan Region
- 5) Losses equivalent to 30% for all the governorates were considered average.

The Applied Cost Estimation Method

The study uses investment capital costs from the year 2018 to 2021 to forecast 2030’s investment capital cost. Subsequently, estimations of the capital, operations and maintenance costs were computed for all the cities, districts and villages in Kurdistan. The cost estimations were computed using the following elements;

- 1) Operation and maintenance costs (electricity, chemicals, repairs, etc.)
- 2) Reinvestment cost.
- 3) Staff cost.
- 4) Water production.

4. Findings

Though cost recovery is considered a viable (Berbel & Expósito, 2020) and conservative (Bhojwani et al., 2019) accounting approach effective for use in water management (Borrego-Marín et al., 2016; Smith & Hanson, 2003), attempts to uncover factors encouraging and discouraging its effective application have been highly dormant. Hence, the practical contributions of this study infer better financial management to water management entities and governments leading to sustainable

water management and supply. As a result, this study delves beyond the mere application of accounting methods in water management to uncover hidden factors that can either encourage or discourage the effective use of cost recovery in water management. Based on observations made by the researcher, water management authorities are well poised to benefit significantly from cost recovery because of reliable water supply, the introduction of house connections, reliable fund collection, consumer involvement, a sense of ownership regarding water sources and strong community leadership. It is to the researcher’s knowledge that these factors have not been uncovered in related studies (Bhojwani et al., 2019; Borrego-Marín, Gutiérrez-Martín & Berbel, 2016; Stavenhagen, Buurman & Tortajada, 2018).

Based on Berbel and Expósito’s (2020) propositions, water users are motivated to pay when they receive high-quality water. This study extends Berbel and Expósito’s (2020) established ideas and incorporates additional factors comprising Hand pump wells, The role of women as fee collectors and the provision of formal education and training (see Table 1), as neutral factors influencing the effective application of cost recovery in water management. Therefore, it can be established in this regard that the existence of neutral factors motivates residents and companies to pay their water bills, which is a highly desirable outcome this study seeks to achieve. Though water is a necessity, factors such as household income and the tradition of raising funds stand to influence attempts by the government to effectively collect payments from residents. Therefore, the study findings have important implications for the structuring of social and economic policies aimed at boosting the standard of living, social and economic development as well as sustainability. This mirrors study suggestions contending that water together with income distribution are pivotal elements of achieving social and economic development as well as sustainability (Giupponi et al., 2006; Russo, Alfredo & Fisher, 2014; Sulaiman, Hamad & Andrea, 2022).

TABLE 1
Cost recovery encouraging factors

No.	Cost recovery encouraging factors
1	Reliable water supply.
2	Introduction of house connections.
3	Reliable fund collection.
4	Consumer involvement.
5	Sense of ownership regarding water sources
6	Strong community leadership.
	Relatively neutral factors
1	High quality of supplied water.
2	Hand pump wells.
3	The role of women as fee collectors.
4	Provision of formal education and training.
	Factors strongly dependent on other conditions
1	Household income.
2	A tradition of raising funds.

Nonetheless, proper judgement can be made by equally analysing perspectives from both the encouraging and discouraging factors. Consequently, the study attempted to uncover factors discouraging cost recovery. As result, it can be established that the government can dimly fail to reap the benefits of cost recovery on the condition that factors such as (1) free water policy; (2) unreliable water supply; (3) mismanagement of funds; (4) delays in collecting water bills and providing services; (5) none involvement of consumers; (6) poor community leadership; and (7) lack of sense of ownership of water points (see Table 2) remain unaddressed.

TABLE 2
COST RECOVERY DISCOURAGING FACTORS

No.	Cost recovery discouraging factors
1	Free water policy.
2	Unreliable water supply.
3	Mismanagement of funds.
4	Delays in collecting water bills and providing services.
5	None involvement of consumers.
6	Poor community leadership.
7	Lack of sense of ownership of water points.

As result, the implications of Tables 1 and 2 results denote that cost recovery has

underlying motivating and demotivating factors overlooked by accountants and calls for water management officials’ immediate attention. Consequently, this sets a good tone for charging rational and profitable water tariffs. Given that water is a necessity, water management authorities are faced with a dilemma as to choosing between a flat fee or a metering use-based fee. The former is not related to usage while the latter involves charging consumers for each amount of water used (Dinar & Subramanian, 1998). Despite Allaire and Dinar (2022) highlighting that a flat fee system is simple to administer and simplifies revenue collection, a considered number of studies criticised such a system advocating for the use of metering systems (Berbel & Expósito, 2020; Smith & Hanson, 2003; Sulaiman, Hamad & Andrea, 2022). For instance, Sulaiman, Hamad and Andrea (2022) argue that water-metering systems are effective in maximising and hence, the KRG is advised to adopt the water-metering system. However, the ability of water-metering systems to warrant effective revenue collection is conditional and subject to the quality of water provided and the availability of proper management systems. Efforts by Kurdistan to set fees to be collected from customers in 2018 as shown in Table 3.

TABLE 3
2018 GAZETTED KRG WATER TARIFFS PER 1M³ AS PER DIFFERENT FORMS OF USES

No.	Types of uses	Range of water use in a month (m³)	Cost per 1m³ in Iraqi Dinar
1	Residential	0-5	50
		5-15	150
		15-30	300
		30-60	450
		Over 60	600
2	Government office buildings	1	400
3	All semi-governmental and none investment buildings.	1	400
4	All commercial, industrial, tourist and investment buildings.	1	600
5	All car washing factories	1	1000

- 1) The data that was used for estimation purposes is attached as supplementary information. As a result, the computed details revealed that total revenue for the year 2021 equaled IQD42 102 600 000. It was discovered that total water expenses incurred by the authorities in 2021 including items related to operations and maintenance equaled IQD373 604 481 574.
- 2) The amount of water provided to KRG residents in 2021 after considering 30% as losses was determined as follows;
- 3) The amount of water provided to KRG residents in 2021 after considering 30% as losses was determined as follows;

$$= 979\,882\,096 \times 0.70$$

(1)

$$= 685\,917\,467 \text{ m}^3/\text{year}$$

This entails that 685 917 467 m³ of water was used during the year 2021 by KRG residents. Thus, the cost per m³ for the year 2021 was determined as follows;

- 4) Cost per m³ for the year 2021

$$= \frac{\text{Amount spent (IQD)}}{\text{Amount of water provided (m}^3/\text{year)}} \quad (2)$$

$$= \frac{IQD373\,604\,481\,574}{685\,917\,467 \text{ (m}^3/\text{year)}}$$

$$= IQD545/\text{m}^3$$

- 5) The total amount of revenue for the year 2021 was IQD42 102 600 000.
- 6) Thus, non-water revenue = amount spent – amount received
 $= IQD373\,604\,481\,574 - IQD42\,102\,600\,000 \quad (3)$
 $= IQD331\,501\,881\,574$

Based on the non-water revenue computations shown above, it can, therefore, be inferred that the Kurdistan Government suffered a loss of IQD331 501 881 574 in 2021. It is important to note that the total amount of money spent includes electricity expenses. Nonetheless, the percentage NRW was computed as follows;

$$= \frac{IQD331\,501\,881\,574}{IQD373\,604\,481\,574} \quad (4)$$

$$= 88\%.$$

The computed NRW percentage of 88% infers that the Kurdistan government was successful in recovering 12% of the total amount of money spent on producing and supplying clean water to KRG residents in 2021. This further implies that the Kurdistan government had a poor ineffective cost recovery in 2021. However, deducting electricity expenses amounting to IQD259 000 000 000 from the total expenditure reduces the NRW percentage. This can be demonstrated as follows;

$$\begin{aligned} 7) \text{ Remaining costs incurred by the government} \\ &= \text{IQD}373\,604\,481\,574 - \text{IQD}259\,000\,000\,000 \quad (5) \\ &= \text{IQD}114\,604\,481\,574 \end{aligned}$$

So, IQD114 604 481 574 is the total amount spent by the government excluding electricity costs and this amount can be used to recalculate the NRW percentage as follows;

$$\begin{aligned} 8) \text{ NRW} &= \text{amount spent excluding electricity} - \text{amount received by the} \\ &\quad \text{government} \quad (6). \\ &= \text{IQD}114\,604\,481\,574 - 42\,102\,600\,000 \end{aligned}$$

$$\begin{aligned} 9) \text{ Cost per m}^3 \text{ for the year 2021} &= \frac{\text{Amount spent excluding electricity (IQD)}}{\text{Amount of water provided (m}^3\text{/year)}} \\ (7) \\ &= \frac{\text{IQD}72\,501\,881\,574}{\text{IQD}114\,604\,481\,574} \\ &= 63\% \end{aligned}$$

Number 8's computations imply that the government recovered 37% of the total amount it spent on producing and providing clean water. This is relatively low as some studies consider 60% as the benchmark of desirable cost recovery (Borrego-Marín et al., 2016; Smith & Hanson, 2003). Nonetheless, the NRW is so high because KRG is facing a huge influx of refugees from surrounding countries as a result of war and terrorist attacks by ISIS, and this adds to the already bad KRG water situation. In response, KRG enacted an emergency response plan to ensure a speedy water supply to more than 2 million residents, which meant an extension of networks. Additional quantities of water were supplied using a strict rationing system causing the government to expend more financial resources on addressing this situation. The

other reason behind the high NRW is the long distance of water sources from demand centres and water scarcity in some areas, which implies a high cost of energy per cubic meter of water supplied.

4.1. Discussions

In light of the study's attempt to examine the role of cost recovery play in reducing water management and supply problems, uncovers that cost recovery, costs, consumers' willingness and ability to pay, water tariff and fee collection structures, financial management, operational technology, and appropriate institutions are major driving forces required in fostering KRG's sustainable water supply. Matching study findings produced by Sulaiman, Hamad and Andrea (2022) show that water supply and sustainability challenges coupled with mismanagement and operational challenges are inevitable when the government is incapable of reliably and suitably supplying water to residents. Barwari (2013) opines that pricing water and hence, cost recovery is impossible because it is public good. Though there is a strong theoretical and empirical resemblance (Berbel & Expósito, 2020; Bhojwani et al., 2019; Borrego-Marín et al., 2016; Smith & Hanson, 2003), all these outlined factors have been practically sidelined in KRG's water management practices and continue to pose huge challenges to its sustainability initiatives. Therefore, the study findings infer that sustainable water management and supply will be achieved only if sufficient financial resources are recovered to keep the system operational.

Amid the rising climate change, population levels and increased refugee influx in the KRG, the potential capacity of the Kurdistan government to address water scarcity problems have been restricted. Though problems posed by climate change, population levels and increased refugee influx are attached to deterioration of infrastructure (Dionigi, 2019) and environmental burden (Russo, Alfredo & Fisher, 2014), their implications on water scarcity have been also empirically sidelined, especially in Kurdistan. This will lead to improvements in the NRW percentage and related outcomes. Hence, the study offers novel suggestions essential for improving both the use of public infrastructure and national resources and contributing to environmental preservation. Most importantly, the findings reiterate the importance

of dealing with the mismanagement of public funds together with the provision of high-quality water services to enhance consumers' willingness to pay for water services. Studies have long hinted that consumers' willingness is attached to the service quality (Donoso, 2017; Wang, Xie & Li, 2010), but relating it to water tariff payment has been beyond their scope.

The study findings address long-standing fundamental questions about what roles should each of the main parties (central government, local administration, water agencies, consumers and the private sector) involved in water supply management should play. Consequently, the outlines that each of these parties should take care of those activities it is best at. As such;

- The government should address policy issues linked to immigration to reduce the pressure on local amenities and the water supply posed by the rising influx of refugees. This also includes making policy adjustments regarding tariffs and social development to progressively charge and collect tariffs through enhanced willingness and ability by consumers to pay for water services. The government is also advocated emulating water tariff systems implemented in developed countries to ensure rational and sustainable management through increased long-term revenue inflow.
- Water agencies must seek to ensure that consumers are equally and reliably supplied with enough water with little or without disruptions.
- The private sector needs to participate in developing the water infrastructure either by increased investment or other facilities such as Build Own Operate and Transfer schemes.
- Local communities have a huge role to play in supporting the water sector by paying their water bills and avoiding misusing water. That is, they are encouraged to use water properly in the right way.

5. Conclusion

In light of the study's attempt to examine the role of cost recovery play in reducing water management and supply problems, the following conclusions were drawn;

- KRG has a low-cost recovery of 13% including electricity costs and 37% excluding electricity costs, and this unacceptably calls for the enactment of appropriate local and social measures, and governmental policy adjustments.
- Sustainable water management and supply require effective incorporation of factors comprising cost recovery, costs, consumers’ willingness and ability to pay, water tariff and fee collection structures, financial management, operational technology, and appropriate institutions.
- Consumers’ willingness to pay for an operative water service remains one of the vital keys to the effective review and collection of water tariffs.
- Lack of proper management institutions, low private sector involvement and mismanagement of funds are posing huge challenges to sustainable water management and supply leading to increased water scarcity problems.

5.1. Theoretical, practical and policy implications

On a theoretical level, the study advances studies on the decision-making theory and its application in the context of the public sector. Such goes a long way in extending such insights to encompass findings ways of eliminating rigidities as it is restricting to mere decision-making to avoid risks and uncertainties. Extending further, such insights can be advanced through empirical studies to develop proper and effective sustainable water management and supply practices. Therefore, this study’s contributions and implications shape and advance sustainability theories and cost accounting empirical studies to improve practical sustainable water management and supply practices used in the Middle East. Additionally, insights provided in this study contribute to shedding light on the key aspects governments must adopt to achieve sustainable water management and supply and contribute to the attainment of global sustainability initiatives.

5.2. Recommendations

The study’s recommendations are in two aspects, one about the general approach to water management and supply and the other regarding the government’s revenue-generating capabilities. As such, with regards to a general approach to water management and supply, the following recommendations were suggested;

The government should address policy issues linked to immigration to reduce the pressure on local amenities and the water supply posed by the rising influx of refugees. This also includes making policy adjustments regarding tariffs and social development to progressively charge and collect tariffs through enhanced willingness and ability by consumers to pay for water services. The government is also advocated to emulate water tariff systems implemented in developed countries to ensure rational and sustainable management through increased long-term revenue inflow.

Water agencies must seek to ensure that consumers are equally and reliably supplied with enough water with little or without disruptions.

The private sector needs to participate in developing the water infrastructure either by increased investment or other facilities such as Build Own Operate and Transfer schemes.

- Local communities have a huge role to play in supporting the water sector by paying their water bills and avoiding misusing water. That is, they are encouraged to use water properly in the right way.

Concerning the government’s ability to increase its water tariff revenue collection inflows, reducing the NRW is vital and requires the following adjustments;

- Establish progressive tariff rates tied to consumption rate.
- Amend water laws to deal with contemporary issues.
- Reducing water loss and wastage by;
 - 1) Raising awareness.
 - 2) Installation of water meters.
 - 3) Replacing old and damaged water pipes.

4) Establishing a district metering area.

- Establishing a high-performance orientated team for better development of water systems and infrastructure.
- Controlling the unbilled and unauthorized consumption by involving the community.
- Provide high-quality water to the community sustainably and reliably.

5.3. Limitations and suggestions for future studies

The study is void of limitations and the major limitation is that it is confined to the application of an accounting method of cost recovery to water management and supply in the Kurdistan Region of Iraq. As a result, the findings are not generalizable to other sectors and countries and limit the application of other accounting and non-accounting methods to water management and supply. given that the study provides an overall picture of water management and supply issues faced in Kurdistan, unequal and irrational water issues together with socio-economic and phycological factors influencing the payment of water bills can vary between regions, districts and villages. Therefore, future studies must consider conducting a cost recovery analysis of regions, districts and villages.

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رێبازی ژمیریاری گه‌رانه‌وه‌ی تیچوون بو‌ به‌رێوه‌بردن و دابه‌ش کردنی ئاو له‌ هه‌ریمی کوردستانی عیراق

پوخته:

ئهم توێژینه‌وه‌یه بریتیه له رێبازی ژمیریاری تیچوون بو‌ به‌رێوه‌بردن و دابه‌ش کردنی ئاو , که هه‌ول دهدات تیشک بخریته سهر ئه‌و رۆله‌ی که ئه‌و رێبازه‌ ده‌بیینیته له‌ که‌م کردنه‌وه‌ی کێشه‌کانی به‌رێوه‌بردنی ئاو و دابه‌ش کردنی . تییدا هه‌ر یه‌ک له‌ سه‌رچاوه‌ ئه‌ده‌بیه‌کان و شی کردنه‌وه‌ی ئه‌و دوکیومینتانه‌ی که به‌رده‌ستن به‌کارده‌هینیته بو‌ ئاشکرا کردن و پشکنینی به‌رێوه‌بردنی ئاو له‌ حکومه‌تی هه‌ریمی کوردستان , و کێشه‌کانی دابه‌ش کردن وه هه‌ر یه‌ک له‌ هۆکاره پالنه‌رو بی سووده‌کان , وه داهاته‌کانی ئاو و ئاراسته‌کانی تیچوون. له‌ ئه‌نجامدا ده‌رده‌که‌وێت که حکومه‌تی هه‌ریمی کوردستان گه‌رانه‌وه‌ی تیچوونی به‌ بری 13% هه‌یه به‌ هه‌ریه‌ک له‌ تیچوونی ئاو و کاره‌با وه جگه له‌ کاره‌با رێژه‌ی گه‌رانه‌وه‌ی ده‌بیته 37% , وه ئه‌و رێژه‌یه تا راده‌یه‌ک قبول نه‌کراوه لو رووی ناوخیی و کۆمه‌لایه‌تیه‌وه , شایه‌نی چاو بێداه‌شانه‌وه‌یه بو‌ سیاسه‌تی حکومه‌ت بو‌ به‌رێوه‌بردن و دابه‌ش کردنی ئاو. بو به‌رێوه‌بردنیکی به‌رده‌وامی ئاو پێویستی به‌ گونجاندنیکی کارای هه‌ریه‌ک له‌ هۆکاره‌کان که ده‌بنه‌ هۆی زیاد کردنی گه‌رانه‌وه‌ی تیچوون و تیچوونه‌کان و ئاره‌زووی به‌کاره‌ینه‌ر و توانایان بو‌ دانی کری ئاو وه په‌یکه‌ری وه‌رکرتنی کرییه‌که‌ی و به‌رێوه‌بردنی دارایی و وه ته‌کنه‌لۆجیای کارکردن و داموده‌زگای گونجاو بو‌ ئه‌م بابته‌. ئه‌م توێژینه‌وه‌ به‌شدار ده‌بیته له‌ پالپشتی تیۆریه‌کانی به‌رده‌وامی لیکولینه‌وه‌کانی بواری تاقیکاری له‌ باره‌ی ژمیریاری تیچوون بو‌ باشتر کردنی به‌رێوه‌بردنی کرده‌کی به‌رده‌وامی بو‌ ئاو وه ئه‌و شیوازه‌ی گه‌یاندنی ئاو که له‌ خۆره‌لاتی ناوه‌راست به‌کاردیته. وه ئه‌م بیرۆکانه‌ی به‌ کارهاتوون له‌م توێژینه‌وه‌ به‌شدار ده‌کهن له‌ تیشک خسته‌نه سهر ئه‌و خاله سه‌ره‌کیانه‌ی که پێویسته حکومه‌ته‌کان بیگرنه به‌ر بو‌ به‌ دیهاتنی به‌رده‌وامی له‌ به‌رێوه‌بردن و که‌یاندنی ئاو وه به‌ دیهاتنی ده‌ستپێشخه‌ریه جیهانیه‌کان له‌ بواری به‌رده‌وامیدان.

منهج محاسبة استرداد الكلفة لإدارة المياه والإمداد في حكومة إقليم كردستان العراق

الملخص:

هذه الدراسة هي المنهج المحاسبي الكلفوي لإدارة و توزيع المياه , التي تسعى إلى دراسة الدور الذي يلعبه استرداد الكلفة في الحد من مشاكل إدارة المياه ومشاكل توزيعه. تستخدم الدراسة مصادر و مراجعة الأدبيات المنهجية جنباً إلى جنب مع تحليل الوثائق المتوفرة للكشف وفحص إدارة المياه في حكومة إقليم كردستان وقضايا الإمداد ، والعوامل المحفزة وغير مجدية ، وإيرادات المياه واتجاهات التكاليف. كشفت النتائج أن حكومة إقليم كردستان لديها استرداد منخفض التكلفة بنسبة 13٪ مشمول كل من تكاليف الماء و كهرباء و اذا استثنينا تكاليف الكهرباء يكون نسبة الاسترداد 37٪، وهذه يكون نسبة غير مقبولة على مستوى المحلي واجتماعي و يحتاج الى اعادة النظر في سياسة الحكومة لإدارة و توزيع المياه. أن الإدارة المستدامة للمياه والإمداد يتطلب دمجاً فعالاً للعوامل التي تشمل استرداد التكلفة والتكاليف ورغبة المستهلكين وقدرتهم على الدفع وتعرفة المياه وهياكل تحصيل الرسوم والإدارة المالية والتكنولوجيا التشغيلية والمؤسسات المناسبة. تساهم هذه الدراسة وانعكاساتها في تشكيل وتعزيز نظريات الاستدامة ودراسات محاسبة التكاليف التجريبية لتحسين الإدارة العملية المستدامة للمياه وممارسات الإمداد المستخدمة في الشرق الأوسط. تساهم الأفكار الواردة في هذه الدراسة في تسليط الضوء على الجوانب الرئيسية التي يجب أن تتبناها الحكومات لتحقيق الإدارة المستدامة للمياه والإمداد بها والمساهمة في تحقيق مبادرات الاستدامة العالمية.