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Abstract

This research study was conducted to establish the determinants of Sustainability of implemented rural water projects in Universal Service coverage Program conducted by World Vision that had a specific objective of reaching 1million people with access to clean water in Rwanda by 2022. Hence, the study considered eleven water supply projects implemented in Nyamasheke district, in the western province of Rwanda, where a total budget of 5,8 million of US dollars was spent, in order to have now a total length of 562 km pipeline installed, with 418 water points and other related infrastructures. The sustainability was considered as dependent variable and the sector policy, post implementation impact evaluation practice, Choice of Technology, the Role of the Private Operator, and water users committee as independent variables. The study used a descriptive research design method and adopted and a stratified sampling method to have related data in this work. The study collected qualitative and quantitative information from 83 respondents, and analyzed them using SPSS model, where the obtained R2 was equivalent to 0.838, which indicates the strong correlation between measured variables. The results found in this work were then tested successfully for Validity. As a result, it was found that the major determinant of sustainability of those rural water supply projects is the contribution of Water users committees, which has a coefficient of 63.5%. The second factor being the Private operator's role affecting the sustainability at 51.3%, then the third factor being the choice of Technology with 18.7% significance. Other factors like sector policy (3.4%), the Post implementation impact evaluation (4.1%) also contributed at some extent to the sustainability of projects under study. Howsoever, the results confirmed that, the most widespread community management model in our case failed to deliver the levels of sustainability that were initially anticipated. The privatization of water operations within a district has been proved to have an extended level of challenges with it, related to total quality management, to budget for operations and Maintenance, to technology in use, to Staffing, and then those related to types of agreements signed. The study recommended that more objective criteria of selection is essential, Close monitoring, regular trainings, increased incentives and other motivations tips and so as to boost members' skills, ownership and accountability, which would lead thereafter to the sustainability of water utilities in the long run.

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1. Introduction

It has been reported that the majority of rural utilities (serving from 50 to 10,000 people) that once relied on central government leadership and resources are now in desperate need of post-construction support to cope with these new responsibilities. As a result, many small systems struggle to provide safe water because of weak governance, poor tariff settings, small resources allocation and a lack of qualified staff to support regular operations (RWSN, 2009).

Again, according to the study conducted by IRC-International Water and Sanitation Centre, only one third of the hand pumps built in rural Africa over the last 10 years are still functional (Skinner 2009). A compilation of hand pump data from 18 African countries published by the Rural Water Supply Network in 2009 reached a similar conclusion (Carter, 2010).

The previous studies and existing literature reveal that Africa water supply system encounter the issue of accountability, from time to times. These Researchers for instance (Abrams, 1998; WELL, 1998; Mukherjee & van Wijk, 2002) identified eight factors being critical to achieving sustainability of rural water supplies: the policy context, the institutional arrangements, the financial and economic issues, the community and social aspects, the technology and the natural environment. Other factors are the Spare parts supply, the maintenance systems and Monitoring. Since then, various models have been adopted for the issue of ensuring the sustainability of water supply systems. In the 1980s, a trend began throughout the developing world that decentralized WASH service provision from the national to more local levels, often with significant negative effects on rural communities.

This Decentralization transferred the responsibility for WASH service provision to local authorities, which is the right level of administration but this change occurred without the appropriate allocation of resources [Time, Financial, human among others].

The main objective of this research project was therefore to ascertain the determinants of sustainability of rural water supply projects in Rwanda.
Our specific objectives were:

i. To assess the effect of post implementation impact evaluation on the sustainability of rural water projects Rwanda;
ii. To find out the effect of water sector policy on the sustainability of rural water projects in Rwanda;
iii. To ascertain the effect of the capacity of water users committee on the sustainability of rural water projects in Rwanda;
iv. To ascertain the effect of the Private Operators (District wide approach) on the Sustainability of Water supply systems in Rwanda.
v. To assess the effect of choice of technology on the sustainability of rural water supply projects in Rwanda.

2. Literature review

This section is just going to consider some of the content of past studies / literatures related to the constructs under investigation in this research.

2.1 Post Implementation Impact Evaluation and the Sustainability of Rural water Project

One study called Triple - S conducted in 2013, published a document that focused on the learning initiative to improve water supply to the rural poor communities (November 2013). The study Triple-S (Sustainable Services at Scale) was a result of a six-year, multi-country learning initiative to improve water supply to the rural poor. The initiative was operating in

Ghana and Uganda from 2009 - 2014. The lessons learned from work in countries feeds up to the international level where Triple-S was promoting a re-appraisal of how development assistance to the rural water supply sector is designed and implemented. Triple-S scoping study on rural water supplies in Ethiopia found that sustainability of rural water facilities is a major issue and one that is now receiving greater attention (IRC, 2011). The study found that levels of non-functioning facilities are high affecting service delivery for many projects, while post-construction support for community management is extremely low.

Yet, Water and Sanitation Program (WSP)-Africa in its report on "Sustainable Management of Small Water Supply Systems in Africa, Field Note, (2010)" stated that sustainable rural water supplies are important for the growth of local economic hubs. The report found that the growth of rural centers and small towns ranging in population from 2000 to 50,000 people are of considerable strategic importance for economic and social development in Africa, contributing to curbing rural urban migration and the accumulation of the unemployed poor in the slums of large cities. Project sustainability is indicated by the ability to continue to meet objectives defined in terms of benefit levels. Sustainability is therefore the ability of a project to initiate a process by which benefits are maintained.

2.2 Sector Policy and the Sustainability of rural water Project

One study conducted in Sub -Saharan countries showed how the policy might affect the sector. It confirmed that many poverty reduction strategies in Africa promote economic liberalization which means the removal of trade restrictions. For instance, this can make it cheaper to import public domain pumps, pipes, and fittings, such as the India Mark II and Afridev, and associated spare parts from India than to manufacture the same pumps locally, even where there is existing capacity to do this. (Harvey and Reed 2004).

The study of Peter (2004) on the sustainability of rural water supply systems show that policies favor donors and foreign manufacturers more than they support sustainable services. Whether pumps are imported or produced locally, third party quality control is an important measure to ensure appropriate standards for equipment and components.

Another study conducted in Kenya, to investigate the factors influencing sustainability of SNV supported rural based and community managed water supplies in Kajiado County, Kenya (Kwena, 2015) demonstrated how sector policy influenced sustainability of SNV supported rural based and community managed water supplies in the study area. The key findings showed that the highest percentage of the beneficiary respondents (43%) thought that the sector policies had influenced in the planning and implementation of their water projects to a great extent compared to 38% who thought that the sector policies had influenced to some extent, 11% who thought that sector policies influenced was a low extent and 6% who indicated that the sector policies had influenced to a very great extent.

On the other hand, in the same study, the Sponsor respondents' opinion on the extent sector policies had influenced ranged from "To a great extent" (27%) to "To a very great extent" (73%). These findings agree with Eisner (1997 who notes that sector policies have an immense influence in the planning and implementation water projects. 64% of the respondents opined that sector influence was important to a great extent. This implies that the community is well aware of the need for the rural water projects to be actively influenced by sector wide approaches, an imperative for sustainability of community development projects whose ultimate goal is to improve the living standards of the community (Eisner, 1997).

2.3 Water Users committees and sustainability of rural water projects

Water user's association is a famous tool for more serious, effective management that still helps to bring about reforms that are desperately needed, but unfortunately, uncommon regarding decentralization. In some countries in recent years the intention was to transfer water source management from the state or regional level to a local level, generally by groups of villages. They are an interesting interim alternative for harmonious water management when the facility cannot yet be taken over by a municipality**.** They provide an official status with legal recognition that allows for greater transparency and more effective management of water sources.

Another study into rural water supply sustainability in Niassa Province in Mozambique found that among all communities visited, finance was compromising rural water supply sustainability as most did not have any savings or collected monthly contributions for operation and maintenance (Jansz, 2011). The study further found that while Water Committees understood their responsibilities, there were variations in how these responsibilities were practiced arising from inconsistencies in capacity and capability. The study found that, while some Committees raised and repaired some water points due to sufficient technical capacity, others did not because those trained with technical skills had left. [Water and Sanitation Program-Africa Region (2002) in its Field Note No.13]

A recent study conducted in Mali, Kara in Togo (2023) Benin and Senegal et al, by caritas organization recommended some changes in the water users management. (Wiki water, 2023), In order to remain on good terms with local authorities, it was suggested that at least one place be reserved in the management committee for a member of the town council, as is generally done in WUAs. It was argued not to cut corners or try to save money on trainings. The role of women was found very important as they were the most directly concerned by water supply; they needed to be closely involved in management of the water source, even if that means setting a quota for the number of positions they hold in the management committee or the user's association. The **s**tudy showed that keeping updated records or a log of the various actions that the commission takes is recommended as well as an account book for the finance commission, a maintenance log for the maintenance commission. These records were found to be helpful in making the actions of the committee or the association more transparent and they also should serve as reference documents for those responsible for the various commissions in the future. The management committees were recommended to take carefully records of various details and data, including those related to equipment malfunctions and breakdowns, and keep them in the appropriate files. This would constitute a database that could be provided to the competent authorities, providing the best follow-up and maintenance for facilities in an entire region and constituting a source of advice on good maintenance practices.

2.4 Private Operators [Privatization] and the sustainability of Rural water Project

Privatization is another key component of many African governments' poverty reduction strategy. While there is nothing inherently wrong with private sector involvement, it is important to recognize its limitations and some of the constraints to its promotion. (Harvey & Reed, 2004). A study entitled Water Governance Decentralization in Africa reported to the Water Research Commission by Hassan *et al.* (2014), confirmed that Many problems are associated with the centralized management approach. Inequality in access to water, limited financial and technical capacity at national and basin levels, poor infrastructure and service delivery, declining quality of river basin natural resources, limited stakeholders' involvement in decision making, institutional fragmentation, uncoordinated sector policies, and increasing

number of conflicts among stakeholders are examples of such problems (Easter and Heame, 1993; Swatuk, 2005).

This research indicated that this process continued to face several challenges, including; Weak political support and appetite for change, and the Major being financial constraints; Complexities associated with joint planning, coordination and monitoring, including information management and reporting on the status of the water resources; Institutional arrangements and duplication of roles between the new institutions and the departments that is responsible for the implementation of WRM in the basin; Human resource capacity constraints including skills to guide the decentralization process; Trans-boundary management aspects, especially conflicting priorities among states and the need to meet strategic social and economic developments needs in the countries; Stakeholder engagement and communication, in particular the need for extensive engagement and empowerment of water users, a process that requires significant financial resources to accomplish. The most important challenge in the slow pace of the decentralization process was found to be the clearly defined water laws!

2.5 Choice of technologies and the Sustainability of Rural water Project

While technology alone does not determine sustainability, it can have a major impact, especially on ongoing operation and maintenance needs. A study made by WaterAid in Mozambique has found that technology choice does matter and that O&M has greatly improved when communities were allowed to select a technology which they believe it is within their financial, managerial and technical capacity to sustain (Breslin, 2003). Technical options should be seen as part of the management solution, however, not as goals in themselves (Lammerick *et al*., 2002).

The number of users per facility should always be assessed considering projected population growth during the life of the facility. Possible options will depend on the potential water sources identified and may include: Upgrading/protecting existing sources; the protection of existing spring; Gravity-fed systems; the rainwater harvesting; Open hand-dug well; Handpump-equipped well; Handpump-equipped borehole; Wind-powered borehole pumps; Solar-powered borehole pumps; Motorized borehole pumps; Surface water treatment and distribution (Skinner, 2003).

It is important that rural water supply projects and programs present communities with a true technology choice and that they are made aware of the financial and managerial implications of each possible option. Water users need to have the freedom to choose what type and level of water services they are capable of managing without any undue external pressure (van Miert & Binamungu, 2002).

The study of Holtslag confirmed that ease of operation and maintenance, user acceptability and cost are important elements to be considered jointly. If a water supply system is not maintained it is because it is too complicated, not 'attractive' or too expensive (Holtslag, 2002).

It is sometimes suggested that communities should not move from an existing level of service to one that is lower (Schouten, 2004). This should not mean that communities cannot move from one technology choice to a lower-cost technology choice. Experiences in Mozambique and South Africa indicate that sometimes communities with failed water systems (including handpumps) have opted for simpler cheaper technologies, such as bucket pumps and protected wells, which they are more confident that they can sustain (Breslin, 2003; Harvey & Kayaga, 2003).

2.6 Rural Water project sustainability

A study made by The Brundtland Commission of the Nations on March 20, 1987 has defined the sustainability in a context of development in the following way: "Sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs".

In our context, Sustainability is the long-term maintenance of responsibility. It has environmental, economic, and social dimensions, and encompasses the concept of stewardship. Sustainability of water supply and sanitation projects has been defined as the maintenance over time of the project benefits (Hodgkin et al, 1994)).

Benefits from water supply projects may be expressed in several ways including health benefits indicated by a reduction in child mortality and morbidity from diarrhoeal diseases, or simply the number of people who have access to portable water from the project. According to Hodgkin, as long as resources can be obtained to operate, maintain and replace the systems from whatever source, there are sustainable benefits. Sustainability is also the ability of the project through the efforts of institutions, to maintain a level of benefits to a static or expanding population after donor assistance has ceased (Hodgkin *et al.*, 1994).

In the water sector, sustainability has to do with sustained access to services, sustainable operation and maintenance of water facilities. The key indicators for sustainable community managed rural water supplies include reliability, adequacy, accessibility, water fetching time, establishment of operation and maintenance (O&M) fund, ownership, user committee existence and functioning (Panthi and Bhattarai, 2008).

In its sustainability framework, WaterAid identified four key things required for sustainability of community managed rural water supplies as: real need and demand, program design and implementation, existence of active water user committees and external support to the community management systems (WaterAid, 2011). Also important are accounting and allocating responsibility for the true cost of sustainability to prevent the collapse of existing systems and reversal of progress made in extending rural water coverage (Montgomery, Batram &Elimelech, 2009). A Triple-S scoping study on rural water supplies in Ethiopia found that sustainability of rural water facilities is a major issue and one that is now receiving greater attention (IRC, 2011). The study found that levels of non-functioning facilities are high affecting service delivery for many, while post construction support for community management is extremely low.

The Study report found the growth of rural centers and small towns ranging in population from 2000 to 50,000 people are of considerable strategic importance for economic and social development in Africa, contributing to curbing rural urban migration and the accumulation of the unemployed poor in the slums of large cities. Water Supply and Sanitation projects utilize three forms of capital: natural capital (water), infrastructure capital and skillful management of human and financial capital, each form of which must endure in 2039 order to achieve sustainability (Hodgkin, 1994). Project sustainability is indicated by the ability to continue to meet objectives defined in terms of benefit levels.

3. Research methodology

3.1 Research Design

The research design type adopted in the present study is a descriptive research design. In fact, we, the researchers, have a clear definition of the issue in water supply system sustainability, and understand well what the problem seems to be. A descriptive research design is used when

the problem is well defined and the researcher knows something about the problem (Mugenda, 2003). The study used a descriptive survey research design with a cross-sectional approach. A survey involved studying a situation as it is, in an attempt to explain why the situation is the way it is (Kothari, 2007) without doing any form of manipulation. This design allowed for accounting and adequate descriptions of activities, objects and persons. The design type has not only offered descriptions and explanations, but also identified and predicted relationships in and between the variables of the study (Kothari, 2007).

A Cross-Sectional approach have been used to collect both qualitative and quantitative data from the respondents. The approach was relatively fast and inexpensive because it provided self - reported facts about respondents, their feelings, attitudes, opinions and habits (Kothari, 2007). Survey design enabled the researcher to make accurate assessment, inferences and relationships of phenomenon, events and issues (Mugenda & Mugenda, 1999). A descriptive survey design ensured an ease in understanding the current status of insight and ideas about the area of study (Zells, 2011). The design choice was based on the fact that the one to conduct this study is interested in the subject of research and has got experience in the study area. With this, all the variables used in the research are clearly understood by the researcher.

3.2 Target Population of the Study

The population of interest is WASH partners of World Vision funded rural water schemes including the water and sanitation corporation, the district water and sanitation officers, water users committee members, and the Private operators in Nyamasheke District. This district is located in the Western province of Rwanda within a cluster called Nyungwe cluster as per WV appellation.

The current study focused on Eleven (11) Projects conducted in Nyamasheke district from the year 2018 to -2022 during the Universal water coverage program implemented in that area. The study respondents were members of water users' committees, Private operators, Districts water and sanitation officers, the implementing contractors, World Vision implementing staff in the area and Managers of WASH project in that period. This made a total of **83** respondents as per the table below.

Table 1. Respondents

RESPONDENTS	FREQUENCY
Water users' committees	53
Private Operator 's District coordinators	04
District Water and Sanitation Officers	06
Contractors	07
WVI Implementing Staff	07
Managers in WV / WASH	06
TOTAL	**83**

The activity of Sampling is the process of selecting a group of subjects for a study in such a way that the individuals represent a larger group from which they were selected (Gay, 2009).

From the sample frame, *Census* sampling have been used to collect data from 83 respondents (District officers, Private operators, WASH facilitators and Engineers on the side of the Donors as well as respondents from the water users' committees).

3.3. Sources of data

The source of data has been the primary and secondary data. To get primary data, the researcher has gone to the field and collected raw data from respondents, in this study, questionnaires have been used to collect primary data. Secondary data has been collected by ways of document reviews, reports and publications.

This study has utilized a questionnaire with open and close ended items some of which have been on the Likert scale. Likert scale is an interval scale that specifically uses five anchors of strongly disagree, disagree, neutral, agree and strongly agree (Mugenda & Mugenda, 2003). The Likert scale measures the level of agreement or disagreement and is good in measuring perception, attitude, values and behavior. The Likert scale has scales that assist in converting the qualitative responses into quantitative values (See attached Questionnaires).

Three research assistants have been recruited to assist in data collection. The Research Assistants recruited from the local area have been briefed on the process and procedures for administering, collecting and recording data not mentioning ethical issues prior to embarking on the research. Data have been collected by drop and pick method. (DOPU) method is an alternative which can elicit higher response rates and reduce non-response bias issues. DOPU involves dropping off and picking up surveys in person and can yield high participation because personal interactions have been shown to stimulate norms of reciprocity (Taylor and Francis online, 2022).

3.4 Data Analysis

All research data were analyzed using qualitative and quantitative data analysis Methods. It has been followed by a systematic process starting with editing of all the data obtained from the field. Every questionnaire has been checked to ensure it was well completed and correctly filled. This were then followed by coding all data hence analyze them with the aid of the Statistical Package for Social Scientists (SPSS Version 16) computer program (Kothari, 2007). After data collection, all returned questionnaires were numbered, categorized and data coded. Specific responses to the structured questions were then assigned each one with a number to give it a numerical code. A code book containing all the variables derived from the research objectives and research questions of the study as presented in the questionnaire have been developed.
Then, Data were analyzed using descriptive statistics including tables, percentages and other measures of central tendency such as the mean, mode and median.
Inferential statistics have also been done where correlation and regression were done to establish relationship and their magnitude between independent and dependent variables. Again, Cross tabulation has been used to analyze some data using a regression model targeting the level of significance of each of 5 variables and how it influences sustainability of rural water supply projects.

4. Research findings

4.1 Correlation Analysis Between Post Implementation Impact Evaluation practice, The Choice of Technology, Sector Policy, Water Users Committees, The Private Operator and Sustainability of WV – RWSPUSC program in Rwanda.

In order to test if there was a significant effect of Post implementation impact evaluation on the Sustainability of WV sponsored RWSPUSC, a correlation analysis was conducted using Pearson's correlation coefficient and significance statistics. The related findings are presented in the Table 2, where we have the followings:

The Pearson's correlation coefficient r = 0.598** between the Post implementation impact Evaluation and the sustainability of WV - supported Rural water Supply project suggesting that the two variables had a positive moderate relationship.

The r = 0.571** and significance p = 0.000 between the sector policy and the sustainability of WV - supported Rural water Supply project suggesting that there was a moderate positive relationship between the sector policy and Sustainability of rural water supply projects.

Again, in the Table 2. below we see the Pearson's correlation coefficient r = 0.837** between water users committees and the sustainability of WV - supported Rural water Supply project, suggesting that the two variables had a positive significant relationship.

The r = 0.874** and significance p = 0.000 between The Private operator and the Project sustainability suggesting that there was a Significant positive relationship between private operator and of WV - supported Rural water Supply project
Finally, we see that in that table, the Pearson's correlation coefficient r = 0.681** between the Choice of Technology and the sustainability of WV- supported rural water supply project, suggesting that the two variables had moderate positive relationship.

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Table 2. Correlation Matrix between the project management practices and the sustainability of Rural water supply projects.

		Post Implementation Impact Evaluation	The Sector Policy	Water Users Committee	The Private Operator	Choice of Technology	Sustainability
Post Implementation Impact Evaluation	Pearson Correlation	1	0.450**	0.743**	0.677**	0.856**	0.598**
	Sig. (2-tailed)		0.000	0.000	0.000	0.000	0.000
	N	83	83	83	83	83	83
Sector Policy	Pearson Correlation	0.450**	1	0.695**	0.593**	0.664**	0.571**
	Sig. (2-tailed)	.000		0.000	0.000	0.000	0.000
	N	83	83	83	83	83	83
Water Users Committee	Pearson Correlation	0.743**	0.695**	1	0.806**	0.851**	0.837**
	Sig. (2-tailed)	0.000	0.000		0.000	0.000	0.000
	N	83	83	83	83	83	83
Private Operator	Pearson Correlation	0.677**	0.593**	0.806**	1	0.766**	0.874**
	Sig. (2-tailed)	0.000	0.000	0.000		0.000	0.000
	N	83	83	83	83	83	83
Choice of Technology	Pearson Correlation	0.856**	0.664**	0.851**	0.766**	1	0.681**
	Sig. (2-tailed)	0.000	0.000	0.000	0.000		0.000
	N	83	83	83	83	83	83
Sustainability	Pearson Correlation	0.598**	0.571**	0.837**	0.874**	0.681**	1
	Sig. (2-tailed)	0.000	0.000	0.000	0.000	0.000	
	N	83	83	83	83	83	83

**. Correlation is significant at the 0.01 level (2-tailed).

Source: Researcher; Primary Data, SPSS, October 2023

4.2 Regression Analysis

In this section, the regression results were analyzed and presented for related interpretation.
In order to establish if the effect of Rural water Project management were causal to the sustainability of WV Supported rural water supply project in Rwanda, and to know which among them were more significant predictor, a multiple regression analysis model was used and the results are tabulated below.

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Table 3: Regression Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				
					R Square Change	F Change	df1	df2	Sig. F Change
1	0.915[a]	0.838	0.828	0.20641	0.838	79.727	5	77	0.000

a. Predictors: (Constant), Choice of Technology, Sector Policy, Private Operator, Post Implementation Impact Eval, Water Users Committee

For Significance Level a =0.005, The Critical F- value is: **2.37**

Table 3 above shows therefore that R^2 **= 0.838,** which suggest that the Post Implementation Impact Evaluation, the Sector Policy, the Private operators, water users committees and the choice of Technology accounted for **83.8%** of that variance in World Vision Supported Rural water supply project Sustainability in Rwanda, while the remaining variables explain the remaining 16.2%. Consequently, further study should be carried out on the remaining variables, which affect the sustainability of WV -Supported rural water supply projects in Rwanda.

Table 4. ANOVA

Model		Sum of Squares	Df	Mean Square	F	Sig.
1	Regression	16.983	5	3.397	79.727	.000[a]
	Residual	3.280	77	.043		
	Total	20.264	82			

a. Predictors: (Constant), Choice of Technology, Sector Policy, Private Operator, Post Implementation Impact Eval, Water Users Committee

b. Dependent Variable: Sustainability

Critical t- value for 95% confidence level = 2,00

Source: Researcher; Primary Data, SPSS, October 2023

The Analysis of Variance results (ANOVA) of F = 79.727 and sig 0.000 suggests that those Five variables are significant predictors of the sustainability of WV – Supported rural water supply projects in Rwanda.

This test indicates that a statistically calculated F value of 79.729 which is greater than the critical F value 2.37 (obtained from statistical results Table), means that the regression equation generated by the study predicts the dependent variable significantly well. Alternatively, this can be indicated by a p value of p = 0.000 <0.05.which further implies that regression model adopted is fit, thus can be used to effectively predict Rural water supply project sustainability based on the functions of the mentioned management practices indicated by the study.

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Table 5: Presentation of regression summary

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients		
		B	Std. Error	Beta	t	Sig.
1	(Constant)	0.443	0.203		2.185	0.032
	Post Implementation Impact Eval	-0.041	0.093	-0.042	-0.444	0.658
	Sector Policy	-0.034	0.076	-0.031	-0.442	0.660
	Water Users Committee	0.635	0.111	0.593	5.741	0.000
	Private Operator	0.513	0.064	0.641	7.984	0.000
	Choice of Technology	-0.187	0.089	-0.258	-2.100	0.039

a. Dependent Variable: Sustainability

Based on the coefficient result the model becomes as follow, with:
Ssp = Sustainability of World Vision Supported rural water supply projects for UNIVERSAL SERVICE COVERAGE
Ev: Post Implementation Impact Evaluation practice;
Ps = The Sector Policy
WuC = Water Users Committee
Pr= The Private Operator

CT = The Choice of Technology

$$\mathbf{Ssp= - 0.041Ev – 0.034Ps +0.635WuC+0.513Pr – 0.187CT+ \varepsilon_t ;}$$

This implies that considering other variables constant, the independents variables have following influences on the dependent variable, as follow:

The change in one unit of **Post implementation impact Evaluation** leads to 4,1% change in the Sustainability of WV -supported Rural water supply project;

The change in one unit of **Policy** in **Water Sector** affects at an extent of 3.4% of the total Sustainability of WV -supported Rural water supply project;

The change in one unit of the **Water users Committee** affects remarkably the sustainability, as it changes 63.5% of the Sustainability of WV - supported Rural water supply project, which is sensitive determinant;

The change in one unit of Privatization [**Private Operator]** affects or leads to 51.3% change in the Sustainability of WV -supported Rural water supply project; which is also significant determinant.

The change in one unit of Choice of **Technology affects** or leads to 18% change in the Sustainability of WV -supported Rural water supply project. In other words, From the findings, while holding other factors constant, an increase in Ev = Post Implementation Impact Evaluation practice; an increase in **Ps (=** The Sector Policy), an increase in a unit of **WuC factor (**= Water Users Committee), **an increase of Pr (**= The Private Operator) , an increase of CT (= The Choice of Technology), affect the sustainability (**Ssp** = Sustainability) of World Vision Supported RWSPUSC Program.

Again, the results of P-Values (probability significance) being less than 0.05 as shown above, it means that these independent variables are significant determinants of the independent variable, the Sustainability of rural water supply projects supported by world vision for universal service coverage. Therefore, the study findings concluded that the practice of Post implementation impact Evaluation, the Review and enforcement of the sector policy, The Proper choice of Technology, the Privatization of rural water supply project operations and maintenance, and the objective selection of Water Users committees as thought by the researcher are directly related to the sustainability of rural water supply project.

5. Conclusion

Following the study results, it was concluded that definitely, the post implementation impact evaluation practice, the Review of Sector Policy, the Management skills of water users' committees, the privatization policy of water operations and Maintenance services, and the Proper choice of Technology have effects on the sustainability of rural water supply projects for Universal service coverage under consideration. Hence, these are among major determinants of sustainability of the utilities and other deliverables that resulted from "Finish the Job" program, for universal service coverage, conducted from 2018 to 2022.

This study has got R-square (R^2) equal to 0.838 (or 83.8%) and adjusted R-square equal to 0.828 (or 82.8%); This analysis shows the goodness of fit of the estimated model used.

This means that up to 83.8% the sustainability of Rural water supply projects in Rwanda, were influenced by changes in the determinants of sustainability as evaluated. The remaining 16.2% were to be explained by other factors not examined in this study.

The results of ANOVA (Analysis of Variance) proved that the P-value were less than 5%, which specifies that the Sustainability of rural water supply projects in Rwanda is significantly driven by at least one independent variable under this study.

Among the Five variables tested in this research, the major determinant of Sustainability was found to be water users' committees that affected 63.5% with a strong correlation of 0.837, the second being the Private Operator company which affected the sustainability of RWSPUSC at an extent of 51.3%, with a strong correlation of 0.874, the third being the Choice of Technology affecting the sustainability of RWSPUSC at 18.7% with a correlation of 0.681, the fourth determinant being the Post implementation impact evaluation practice that affects sustainability at 4.1%, with Correlation of 0.598, and the last or fifth determinant being the Sector Policy which affect the sustainability of RWSPUSC at 3.4%, with a correlation of 0.571. In our study, the calculated F-value was equal to 79.72 and this is greater than critical F-Value which is 2.37. Consequently, the general regression model is found to be significant.

The above results of our research prove that, if Water users' committees were objectively selected, with revised criteria (among which required level of education, members subjected to frequent and regular trainings, members motivated to fulfill their responsibility instead of just volunteering, among others), this would Lead to the anticipated sustainability of WV - supported rural water supply projects conducted for Universal service coverage from 2018 to 2022.

Again, if the Private operator was selected adequately, and monitored to fulfil regular O&M, with sufficient budget, using competent staff and modern information management tools and technology, supervised and assisted to fulfills well his duty, there would have been a Maximum Chance to Achieve the needed Sustainability of those rural water project implemented in

Rwanda. If again, more emphasis was attributed to the appropriate technology, effective fact – based staffing, improved partnership for joint planning, associated with enough time to conduct and review project design details, time for monitoring and evaluation, clear and Flexible terms of references in signed agreements, proper allocations of resources, the application of total quality management principles, among other facts highlighted, the Sustainability of World Vision Supported Rural Water supply Project in Rwanda would be a reality guaranteed on field.

6. Recommendations

The privatization and Decentralization of water services in our country should go hand in hand with proper allocation of funds as well, and the objective human resource management, without forgetting more resources for Evaluation and monitoring. It means that, the more we expect from the Private operator, who is not a Government institution, but a Profit oriented Company, the more we should think of reviewing the clarity of ToR agreed on in signed contract, the more we should think of related Budget allocation, and the more we should think about increased resources for monitoring and evaluation, and all that for the effective and efficient execution of the private operator's duties in this regard.

This study suggests also the presence of a toll-free Line, for a smooth communication with beneficiaries, for all the private operator's offices. Again, the study recommends a modern and digitalized data collection model, recording, storage and processing system approach to monitor and respond to all operations maintenance needs in water Network, with an example of using SCADA (Supervisory Control and Data Acquisition system). The use of MIS Management information System is recommended, for easy data access and analysis for any Fact-based decision making, by water operators.

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