Journal of Entrepreneurship & Project Management

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ISSN: 2616-8464

Stratford Peer Reviewed Journals and Book Publishing
Journal of Entrepreneurship & Project management
Volume 7||Issue 2||Page 42-63||May||2023|
Email: info@stratfordjournals.org ISSN: 2616-8464

Post Project Evaluation Indicators and Sustainability of Community Water Projects: A Case of Ngoma Water Supply Project in Rwanda

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How to cite this article: **Mugwaneza, V., D. & Wanjiku, C. (2023). Post Project Evaluation Indicators and Sustainability of Community Water Projects: A Case of Ngoma Water Supply Project in Rwanda.** ***Journal of Entrepreneurship & Project Management,*** **7(2), 42-63.** https://doi.org/10.53819/81018102t3079

Abstract

Community water project has been visualized as an engine for promoting resilience and livelihoods. The major objective of this study was to assess post-project evaluation indicators and sustainability of community water projects, considering the case of Ngoma Water Supply Projects in Rwanda implemented by WASAC in collaboration with JICA (2015-2017). Specific objectives of this study were to investigate project relevance and sustainability, project efficiency and sustainability and project effectiveness and sustainability of community water projects in Ngoma District. A cross-sectional research design was employed used. The total population was 81 including Ngoma water supply project beneficiaries, staff of WASAC, water service providers, Ngoma district officials, and district development partners. Using Yamane's formula, the sample size was equal to 67. Data was collected using well-structured questionnaires, and interview. Quantitative data were edited, cleaned, and analyzed using a statistical package for social sciences (SPSS version. Descriptive and inferential statistics were used to analyze quantitative data while qualitative data were analyzed thematically. The findings showed that 61.2% strongly agree that considering project beneficiaries' needs influence the sustainability of community water project. Based on the interpretation of collected and analyzed data during this study, the findings showed that 61.2% strongly agree that considering project beneficiaries' needs influence sustainability of community water project; 64.2% asserted that effective allocation of resources influence sustainability of community water project and 56 out of 67 represented by 83.6% and 11 out of 67 represented by 16.4% respectively strongly agree and agree that, looking at whether the constructed water supply systems is accessible and near to the beneficiaries influence sustainability of community water project. The overall findings concluded that there is a high positive correlation. The study recommends community water project initiators to invest in methods of implementing the project for sustainability purposes as a part of project relevancy and similar projects to involve community water project beneficiaries from design to implementation in order to raise their ownership.

Keywords: *Post Project, Evaluation Indicators, Sustainability, Community Water Projects, Water Supply Project*

https://doi.org/10.53819/81018102t3079

Stratford Peer Reviewed Journals and Book Publishing
Journal of Entrepreneurship & Project management
Volume 7||Issue 2||Page 42-63||May||2023|
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1.0 Background of the Study

Access to water is key in promoting resilience livelihoods. Sustainable management of water supply projects would ensure water for drinking, domestic, livestock and other productive uses is enhanced to support inhabitant's livelihoods. The government and civil society organizations have implemented many projects worth millions of investments but still facing sustainability challenges over a period. Globally, the report released by World Health Organization (WHO) published in 2020 on access to clean water and adequate sanitation and hygiene stated that 2 billion people lack access to safely managed drinking water at home. Of those, 1.2 billion people have basic drinking water service (WHO, 2020). Moreover, between 2015 and 2020, 107 million people gained access to safely managed drinking water at home, and 115 million people gained access to safe toilets at home and 8 out 10 people who continue to lack basic drinking water services live in rural areas (CDC, 2022).

Many initiatives have been made to reduce the gap of water scarcity by large investments in water supply infrastructure among other interventions in the water sector. Among the initiatives made including one of achievement of Millennium Development Goals whereby water provision in 2015 where 91% of the world's population were able to access water from an improved source of drinking water compared to 76% in the year 1990 (UN, 2015). However, despite the outstanding achievements, the issue to what can government, private sector, development partners, and other actors in water supply and management do to increase the probability of ensuring sustainability of the investments made aiming to access water to the community. Reducing significant losses in investments in water delivery is the major goal of water sustainability from an economic and development perspective (Kativhu, 2021), further analysis of Katibhu also showed, despite success in coverage of new rural water infrastructure in the last 2–3 decades, in many countries 35% are not functional. For sustainability purpose, project target beneficiaries' participation and management are presumed to be instrumental for sustainable water projects es (Dube 2012, Kamruzzaman*et al*. 2013).

The majority of sustainability assessments for community water supply initiatives merely offer a quick overview of sustainability problems. Few people look at how sustainability parameters vary over time and how these changes affect long-term sustainability outcomes. The sustainability of the community water projects is enhanced by ensuring that only projects prioritized by the beneficiaries are implemented, building the capacity of the beneficiaries and enhancing project ownership (UN, 2018). Project implementers ensure that a management and sustainable operations concept is established to ensure projects continues to meet the needs of the recipients over time. This is through key stakeholder's involvement from project preparation phase (Tarius, 2016).

Like other continent, Africa has been investing in improving livelihoods of the citizens mostly for the last 2 decades through initiating numerous projects aiming to change socio-economic of its population. The sector of water supply and sanitation has been one of the priorities. Although a few African countries have high annual averages of water per person, many already or soon will face water-stress. The recent report published by United Nations 2022 found that Africa's average basic drinking water service is 71%, "leaving behind some 29% of the total population" or more than 353 million people. Similarly, according to World Economic Forum (2022) found that only 39% of the Sub-Saharan African population has water connected to their homes, dramatically this figure drops to just 19% going down in East African Countries and among the

East African Countries, the report revealed that Democratic Republic of the Congo faces some of the worst water scarcity issues in the region, with less than 1% of its rural population having access to on-premises water (WEF, 2022). Through mobilized development partners, community water projects have always been implemented in either city and rural settings in almost all African countries, however, due to some 45% of Africa is arid or extremely arid, 22% is semiarid, leaving only 33% as sub-humid or humid; climate change issue, ecological deficits over nearly four decades of droughts has predisposed the environment to a high level of desiccation and vulnerability; water scarcity driven by increasing population pressure; unsustainable policies; ignoring to involve community or beneficiaries in the community water projects during designing and implementation are some of the forefront reasons that cause some of the project to not sustain (Lekan, 2009).

Despite the remarkable achievements and aspirations of the Government of Rwanda (GoR) to position the country into middle-income countries in 2035 and high-income countries in 2050, Rwanda is still battling to create a resilient community that ensures fully access to clean water and ensure the sustainability of community-based water projects. According to the new Ministry of Infrastructure of Rwanda (2018 -2028), the water and sanitation strategic plan (2018-2024) in line with achieving broad water supply and sanitation targets of at least basic water supply services for 100% of people by fast-tracking implementation of strategic investment program as well as achieving at least basic household sanitation coverage for 100% of households. However, aaccording to the report of United Nations Childrens' Fund (UNICEF) of 2022, only 57 per cent of the Rwandan population access safe drinking water that is within 30 minutes of their home, in additional, even if water is available near the home, that water is often not safe to drink. The strategic plan highlights that the sustainability of community-based water projects lies in the nature of the country which is mountainous, landslides that can deteriorate existing infrastructure, inaccurate data from baseline and feasibility surveys among others (MININFRA, 2018).In addition, 11.9% of the rural water supply systems in Rwanda are either non-functional or partially functional and the majority causal factor for this nonfunctionally rate is aged water supply systems (Spandrel, 2020).

Worldwide, post-project evaluation is an indispensable part of the project management process. In developing countries, rapid urbanization and population growth go with increased investment that is put in infrastructure development, among which water supply projects are highly considered. Clean water being one of the basic needs for the human being and its welfare, it also appears to be one of the key economic factors to be invested in. Investing in water supply projects would benefit not only into human welfare, but in economic development, poverty reduction and public health. For that reason, and as far as a project is concerned; it is of high importance to monitor and evaluate water supply projects performance from its early initiation stage until its completion, in order to ensure its effective completion but mostly its sustainability. Going down in Eastern part of Rwanda where Ngoma district is located, more than three million Rwandans in six of the seven districts that make up the eastern province (Fred, 2022).

The post-project evaluation also considers analyzing the performance of the project Vis a Vis the desired outcomes, to ensure that the project is sustainable and delivers the desired objectives. Project post-performance evaluation is very important in the context of effective project management as well as value for money, which are the key factors to attaining the sustainability in delivering to the desired level. The lack of post-project evaluation has led to inefficiency use

of resources and prematurely failure of developed infrastructure; mostly in countries where project management practices are not yet well established, specifically in underdeveloped and developing countries in the Eastern part of Africa. To this end, Rwanda is also putting in more efforts and mechanisms to improve in terms of project management and project sustainability through adequate monitoring during the project execution period as well as the post-projects evaluation. As an outcome, more sustainable infrastructure, Socio-Economic development, and reduced rate of corruption are envisaged. The Post Project evaluation indicators to be considered in this study are the Efficiency, Effectiveness, Impact, and Relevance

1.1 Statement of the Problem

In line with global trends of investing in improved and sustained community water projects. According to the report published by United Nations Children's Fund (UNICEF) globally, out of three people living in the rural areas, only one is using safely managed drinking water services or 1.9 billion (UNICEF, 2022). The report highlighted that still many rural populations lack safely managed water systems. It was also reported that 263 million persons spent more than 30 minutes per round trip to fetch water from an improved (UNICEF, 2017). However, since water use generally needs a lot of infrastructural investment and management systems, the issue of sustainability is a major global, regional and nation concern which led to a half of initiatives not to sustain (UN, 2020). The majority of sustainability assessments for community water supply initiatives merely offer a quick overview of sustainability problems not linking with the contribution of post project evaluation which is the gap that this study seeks to address. In addition, the majority of research published in the field (Dangui 2022; Adebayo 2021; Olanguju 2019, Olela, 2018; Rehema, 2017; Rutto, 2017; and Rushagika) focus on the contribution of stakeholders' engagement to the sustainability of community projects. Moreover, the reviewed literature and existing knowledge in the similar area revealed a gap of examining the extent to which examining post project evaluation indicators mainly relevance, efficiency and effectiveness influence project sustainability particularly community water projects which is the problem that the present study aims to address.

1.2 Objectives of Study

The main objective of this research is to investigate post project evaluation indicators and sustainability of community water projects: A case of Ngoma water supply project in Rwanda.

1.2.1 Specific Objectives

i. To investigate project relevance and sustainability of community water project in Ngoma district;

ii. To assess project efficiency and sustainability of community water project in Ngoma district;

iii. To examine the project effectiveness and sustainability of community water project in Ngoma district.

2.0 Literature Review

2.1 Theoretical Literature

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Journal of Entrepreneurship & Project management
Volume 7||Issue 2||Page 42-63||May||2023|
Email: info@stratfordjournals.org ISSN: 2616-8464

2.1.1 Community water projects

It is important to understand what is meant by post evaluation practices and water supply infrastructure from the global perspective right from the start of this section to set the stage for discussion on post evaluation of completed water supply infrastructure projects. Zain (2015) broadly defines infrastructure as capital facilities with long lifespan that enable the delivery of certain services in urban cities, small towns, rural and household levels and also offer services that boost production in the private sector. These may include services from power generating plants, transportation systems, telecommunication, and water supply and sanitation systems among others Manggat, Zain and Jamaluddin (2018).Countries around the world have stepped up to ensure enough water for their citizens by initiating proper schemes through government authorities, supporting non-government initiatives, and giving subsidies to local projects in order to achieve the Sustainable Development Goals, particularly goal No. 6 related to achieving the universal access to clean water (Heazlewood *et al*., 2022). For the purpose of this research, the center of discussion will be on community water project completed specifically in Ngoma District. Here water supply infrastructure will be referred to as structures and services that are being operated by water service providers in Ngoma District owned by the public. Such critical infrastructure comprises of network pipes, water and wastewater treatment plants and pump stations, storage tanks, sources (wells, intakes of surface water), pumps, water meters and land.

2.1.2 Post-project evaluation

Japan International Cooperation Agency JICA (2004) offers an operational definition that describes what this type of evaluation is, what its objectives are, and how it is done. Post-project evaluations are performed within a certain period after a project is completed, and most are not planned while projects are still operating. As staff may no longer be available, and project activities are not observable, PPE is based on existing reports, monitoring reports, and other written information, and often include additional data collection. While such evaluations may assess the extent that projects implemented planned activities and how well outcomes were achieved, given they occur after projects end, such evaluation may also focus on long-term impact and sustainability (Dangui, 2022). PPEs consider retrospective circumstances surrounding a project and other elements that may have influenced the implementation, impact, and sustainability of results. Post-project evaluations represent assessment of the project after its completion, analyzing the actual, as against the projected estimates in respect of time, cost, and quality specifications. The evaluation includes investigation of the variances per constituent of the project objectives (and, within such constituent, major elements of variances) leading to the assessment of the overall situation Tache (2011).

The fundamental objective, however, is the possible use of the valuable knowledge and experience gathered from the completion of the project. After the project is completed, the project owner and management are given access to a valuable database that may be saved for future use. The financial institution may discover weaknesses in project appraisal at the early stage and/or a lack of appropriate monitoring by itself during the implementation process, among other things, as a result of the post-project evaluation and, as a result, adjust its lending policy for the future Downs and Kondolf (2014). The process of such evaluation can be carried out in two phases: Soon after the completion of the project; and after the lapse of about two years since the completion of the project.

2.1.3. Sustainability of Community Water Projects

Project sustainability component may change according to the desired project goals by the stakeholders (Jelena *et al*., 2021). Sustainability is often understood to be development that satisfies current needs without jeopardizing future ability to satisfy those needs (Brundtland, 2014). When water remains accessible in the same quantity and quality for the duration that a supply source is intended, it is said to be sustainable (Abrams *et al*., 2018). Sustainability for a water supply system is defined as the maintenance of an adequate level of services throughout the design life of the water supply system. Following project completion, the community is handed ownership and management responsibilities. It has been shown that some projects fail notably even when there are no technical issues, but other programs have succeeded with little difficulty. Therefore, it would be crucial to determine the root reasons for performance variations in community water supply projects in order to construct new development projects as well as manage current projects sustainably (Jelena et al., 2021). According to Ingle (2015), a project must be implemented using a strategic strategy in order to attain sustainability. It is therefore of great importance to consider sustainability of a water supply project as for any other project from the project conception stage since the efficiency and effective project implementation has a significant role to play when it comes to sustainability attainment.

The sustainability of community-based projects determines whether they are successful or unsuccessful. If not properly taken into account during the project management cycle, a number of elements, including technical, financial, institutional, economic, and social aspects, contribute to the failure of the projects to be sustained. Availing water infrastructure requires utilities to have the technical capacity to manage, operate and maintain the assets, planning and financial mechanisms in place, and the ability to acquire more of infrastructure for the expansion of services Ehlers (2014). However, many utilities in developing countries struggle a lot in the acquisition of this infrastructure let alone, have failed to sufficiently maintain, and manage the assets. Briceno (2014) suggests that increasing access and quality of infrastructure services needs sizable investment and expenditures on operations and maintenance. However, this is contentious in the small-town subsector, as the population exists of the majority poor who are mobile with varying willingness and ability to pay, yet the infrastructure is immobile and requires delivering as promised by design and affordability Cardone & Fonseca (2016). However, due to capital-intensive nature of water infrastructure that requires large funding poses a big challenge to utilities in small towns, as they do not have adequate funding to meet the growing demand for more infrastructural services, WaterAid (2010).

2.2 Empirical Literature

2.2.1 Project Relevance and Sustainability of Community Water Project

While sustainability assessments offer a method of integrating the various dimensions of sustainability within one common method one particular area requiring further attention is the relevance of the project (Morrison-Saunders *et al*. 2014). The need for greater attention to the paying attention to the relevance of the project during designing has been highlighted in recent work of Canter & Ross (2014) arguing for greater integration within the impact assessment discipline. When considering the relevance of the project, the importance of addressing the diversity of sustainability issues is evident with proponents and practitioners alike confronted with the need to determine 'which of the plethora of sustainability issues could be considered in

each case really matter and what really the target group needs among the best (Morrison-Saunders *et al*. 2014). The relevance of a project describes how efficient the outcome of the project is expected to be with respect to a given goal, to be specified by the evaluation or by the project being submitted. This means that the relevance of a project has always to be related to some goal and, for general research projects, that goal is most often the increase of our scientific knowledge, although it is sometimes also related to more direct social or environmental benefits for our society. In this last sense a project on renewable energy will be considered more relevant than a study of medieval music, although both may be scientifically relevant (OECD, 2016).

If a research project is set up in order to solve a specific problem, one may specifically judge the relevance of the proposed methodology with respect to solving this problem. This contains some aspect of feasibility but it is more than this: it may be quite feasible to perform a proposed project, whereas its result will never be able to solve the problem at hand because one started from a false assumption (Adebayo 2021). In the context of development research, one might look at a project's relevance for developing countries, which would then describe the usefulness of the expected outcome for solving some of the problems in these countries, or at least for obtaining a better understanding of these problems. Remark that also a purely scientific project may have some relevance in this respect, when it can increase the intellectual, educational and research capacity of a country. Analyzing the relevant is the process by which identified sustainability issues associated with project activities are refined and prioritized for focus in analysis of potential impacts (Morrison-Saunders et al. 2014; Donovan et al. 2017).

The key purpose of project relevance is to define the focus of any assessment 'on the few effects that will influence the decision about the proposed action' (Thomas, 2018). While this has been a broadly acknowledged purpose, there remains significant challenges due to competing interests on what should be included and the perceived need to 'require everything under the sun to be included in (Thomas, 2018). This dilemma is not surprising, given that sustainability issues are multifaceted and require consideration of interconnections and interdependences. Engaging a holistic approach to understanding the sustainability issues and impacts of a project requires the assessment of these linkages (Ramos, 2016). Creating an environment in which to remove silos and bring together discipline-specific expertise is critical (Saunders et al. 2014). A 'balance' discourse is necessary to enable equal consideration of sustainability issues across social, economic and environmental dimensions; yet, it 'poses a considerable challenge for integrated assessments to achieve the necessary "win-win-win" outcomes envisaged to derive from sustainable development and sustainability (Claire, 2018).

2.2.2 Project Efficiency and Sustainability of Community Water Project

With sustainability now emerging as a relevant perspective in project management, the question remains, what practical instruments and tooling are available to enable the project manager to assess a project's environmental, economic and social impact. Silvius *et al*. (2017) found that a distinct group of project managers needs practical knowledge, tools and results in order to consider the sustainability aspects of their projects (Silvius et al., 2017). Efficiency has been considered as one the major component that should be considered key indicator during assessing impacts of implemented projects (Abdul, 212).

In the last years, a number of structured 'project sustainability impact analysis' instruments have been published and for the purpose of efficiency allocation of resources and ensure project met

to its intended target, it is always important to consider efficiency. In this expert seminar, a list of sustainability criteria for projects was developed (Silvius, 2010) that can act as a checklist to assess the sustainability impact of a project and for value of money and efforts, it is always important to measure the extent to which the project was efficiently enough From our side, project efficiency is the production of an output in a qualified and competent way in terms of the agreed scope, cost, time and quality, where quality is not a constraint per se but is often a by-product of the other three factors (scope, time and cost). For efficiency, if the project is relevant but it is not done the right way, the customer might not want the outcome (Pedro, 2015). It might also be that the customers actually want the outcome, but it is too expensive so they won't buy it. As mentioned before, efficiency is about performing in the best possible way with the least resources, time and effort. If these factors are not taken into consideration, the outcome might be far from what the customer expected. Therefore, it is important that the project objectives are clear, and followed thought (Olela, 2018)

2.2.3 Project Effectiveness and Sustainability of Community Water Project

Sustainability assessment tools for buildings contribute towards a more sustainable architecture because they recognize and institutionalize the importance of assessing the economic, environmental and social impacts edifices create. In enabling the use of assessments of buildings' sustainability, they provide a necessary framework for the design and construction of more sustainable buildings; consequently, they encourage research in this field (Dangui, 2022). Though project efficiency and effectiveness are important when aiming for success, the concept among project management is somewhat unclear. The concepts are often used in the field of project management, but rarely defined. The scope of efficiency and effectiveness is wide and the two concepts can be used in a lot of different situations. Efficiency shows how productively resources are used to achieve a goal and effectiveness is a measure of the relevance of the goal. Efficiency is about doing things right and effectiveness is about doing the right thing (Rehema, 2017). There are great ideas everywhere. But one idea might be great for a certain location for example, but not so great for another location. The same goes for projects. A project can have objectives that are really interesting and considered as a great idea by someone, but that someone might not be a customer and the actual customers might not want to buy the outcome. No matter how "great" the objectives are, if they are not aligned with the organizational strategies and goals, they might not be great for this project (Armah, 2018). That is why it is important to think about project effectiveness.

One of effectiveness pros, is that it can lead to success. But when there are pros, there are usually cons as well. If projects objectives are aligned with organizational strategy and goals, but the strategy and goals are not relevant, the project will most likely not be effective, i.e., customers don't want it. That's why it is also important that the organizational strategy is effective. One example is Nokia's phones. They used to be very effective and efficient, but when they should have been focusing on software, they were focusing on hardware, and did not adopt to the market. Their strategy was lacking effectiveness· and even though they might have been doing things right in order to achieve their goals, they were not doing the right thing. What can be taken from this example? Projects objectives not aligning with the organizational strategy does not always have to equal low level of effectiveness for the project. Effectiveness should not prevent innovation or development. However, it might seem untrustworthy and unprofessional to develop a project that does not adjust the organizational strategy. Project managers should be

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Journal of Entrepreneurship & Project management
Volume 7||Issue 2||Page 42-63||May||2023|
Email: info@stratfordjournals.org ISSN: 2616-8464

able to trust that the organization's strategy is relevant, but it is good to have eyes everywhere, and if a project manager sees a new opportunity, there might be time to update the strategy (Armah, 2018).

2.3 Theoretical framework

2.3.1 Sustainability theory

The World Commission on Environment Development (WCED), a division of the United Nations, first promoted the idea of sustainability in 1970. The idea was based on the principle of environmental limit, an economic theory developed by David Recardo and Thomas Malthus (1766–1834). (1772-1823). The theory's justification is that the resources in the world in which we live are limited (White, 1996; WCED, 1997). The idea of sustainable development and sustainability first took shape in the WCED report, namely our common future, and later gained popularity with environmental protection. Sustainable development, according to WCED, is the process of meeting present-day demands without compromising the capacity of future generations to satisfy their own requirements (WCED, 1987). Therefore, the idea of sustainability in this study refers to individuals being able to maintain and preserve the project or program outcome using their own resources without jeopardizing the needs of future generations. Sustainable development is defined as meeting current needs without endangering the potential of future generations to fulfill their own desires and goals (Bossel, 1999, World Bank, 2005; ILO, 2012 & CEC, 2013). The necessity for sustainable development has become a concern everywhere in the world. When assessing the community's capacity to handle projects, understanding sustainability issues is essential. The capacity of a community to oversee a project is a sign of sustainability. Any capacity building activities must take into account the premise of sustainability theory while considering the interconnection of local and larger networks, which is also a systemic feature as indicated above.

According to the notion of sustainable development, managing the process of change, rather than establishing a final objective with predetermined results, is the main concern of sustainable development. It acknowledges that there are uncertainties, which need for adaptable and continuous processes. Additionally, it promotes diversity and distinctions within the neighborhood. Consideration of the social, political, economic, and cultural ties essential to the development agenda is ingrained in this idea. According to this theory, sustainable development calls for communities to behave locally while thinking critically about and adjusting the minute details of the interactions that eventually define these communities. Three fundamental competences, namely contextual, behavioral, and technical skills, are necessary for project management. Project managers and the team need contextual competency in relation to the sustainable approach to community development more than they do behavioral and technical skills. (Beata, 2014) As we consider the subject of this study, sustainable development theorists teach us that it is necessary to ascertain community preferences and balance conflicting interests in order to identify community needs and define priorities. This argument states that in order to increase the likelihood of a successful and long-lasting outcome, people and their social institutions must be involved in the community planning process (Chaskin, 2001; Robert, 2001; Oyugi, 2013). Many effective programs fail because their developers never took the time to evaluate the community's resources or capacity before implementing the programs. Long-term objectives of sustainable development should aim to promote equity and fairness, encourage

social cohesion, improve community engagement, strengthen institutional development, and empower individuals (Claire, 2019)

According to the philosophy of sustainable development, social and human capital should be managed similarly to natural resources. Utilizing these resources wisely and effectively benefits local communities in the long run (CEC, 2013). The analysis in this study draws on the contention of sustainable development theorists that capacity assessment is an essential building block for community involvement in development projects. As a result of this reasoning, important indicators for community development sustainability have been chosen as follows: sustainability of project outcome, preservation of project deliverables procedures, resource mobilization capability, and establishment of human capacity. The theory has received some criticism, with some claiming the word is overused and therefore useless; in other instances, the idea is outright denied. People who usually support sustainability often complain that its definition is too imprecise (UN, 2017). There is also the implication that without having a good comprehension of the concept, it is too straightforward to presume that sustainability has been accomplished. Governments and businesses may thereby assert their sustainability while carrying on with business as usual. How to determine whether sustainability is being realized is another problem.

2.3.2 Resource Based Theory

Penrose (2009) introduced Resource-Based Theory (RBT) for the first time by putting up a model for the efficient management of organizations' resources, diversification tactics, and business possibilities. The idea of conceptualizing a firm as a coordinated collection of resources to address and tackle how it can achieve its goals and strategic behavior was first put forth in Penrose's publication (Penrose, 2009; Penrose, 2009). In the 1980s, RBT started to take shape. The Theory of the Growth of the Firm served as RBT's forerunner. Later, in the 1990s, Jay Barney's work became the dominant paradigm in strategic management and strategic planning and was crucial to the development of RBT.

RBT offers a framework to identify and forecast the core elements of organizational performance and competitive advantage. In response to prior managerial interest in the industry structure, a more macro perspective, RBT turned its attention to the firm's performance from a meso perspective. As opposed to externally driven techniques to understanding the success or failure of leveraging organizational activities, RBT addresses an internally-driven approach by concentrating on internal organization resources (Kozlenkova, Samaha & Palmatier, 2014). It seeks to elaborate on corporate resources that are imperfectly replicable but could perhaps generate long-term competitive advantage (Barney, 1991). The theory is in line with the current study because it is emphasizing effective and efficient use of resources.

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Journal of Entrepreneurship & Project management
Volume 7||Issue 2||Page 42-63||May||2023|
Email: info@stratfordjournals.org ISSN: 2616-8464

2.4 Conceptual framework

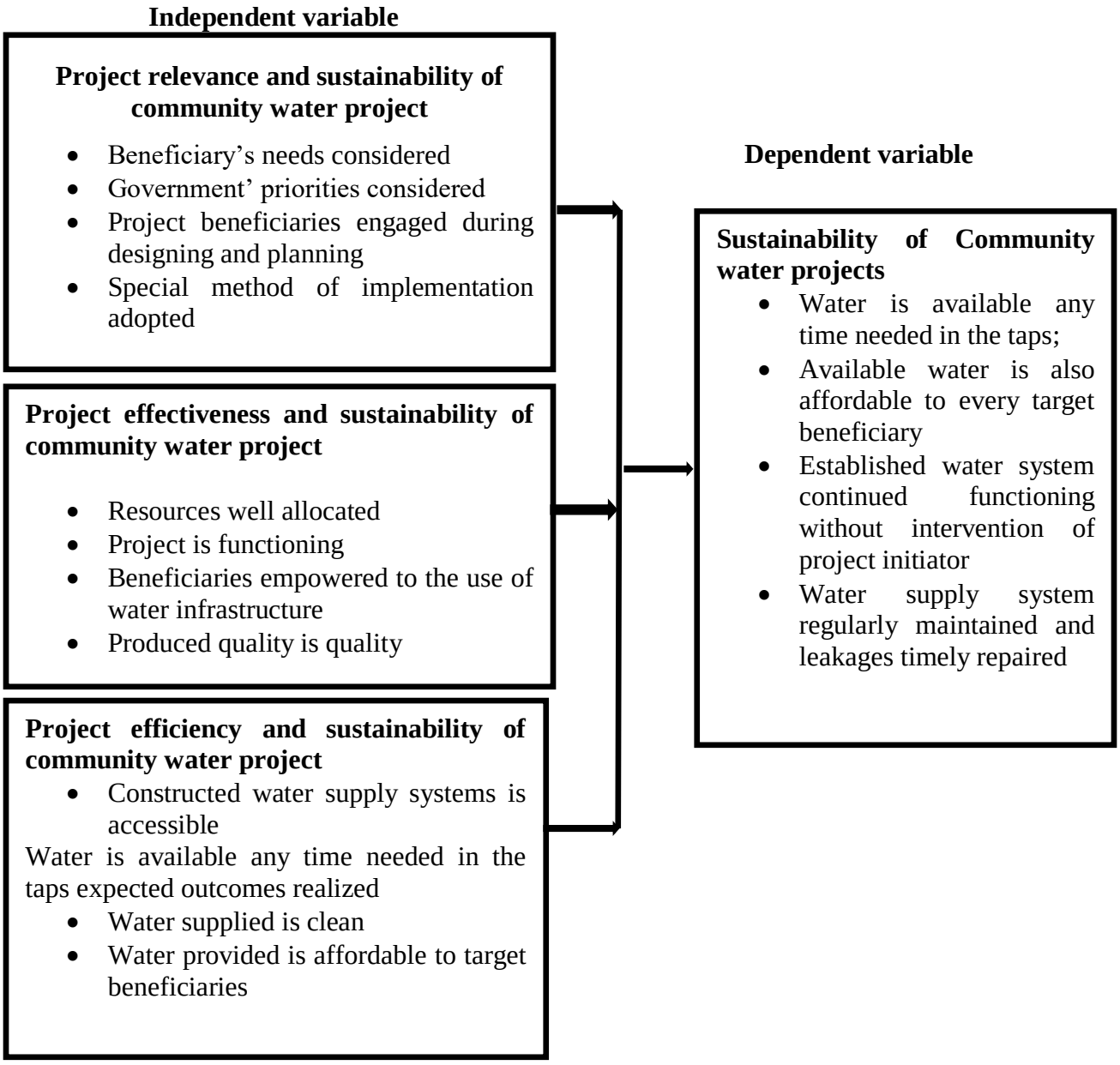

Figure 1: Conceptual Framework

3.0 Research Methodology

The study employed descriptive research design. The target population was 81 beneficiaries of community water projects from Ngoma district, water service provider, District Officials, WASAC staff and staff of NGOs operating in the project district. Yamane (1967) formular was used to obtain a sample size of 67. The study three data collection instruments will be used: Interview, Questionnaire and documentation review. Quantitative data was analyzed using Statistical Package of Social Sciences (SPSS) and Microsoft Excel. Qualitative data was analyzed using the thematic approach.

https://doi.org/10.53819/81018102t3079

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Journal of Entrepreneurship & Project management
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Email: info@stratfordjournals.org ISSN: 2616-8464

4.0 Research Findings and Discussion

The majority of the respondents were male (42 out of 67) which was represented by 62.7% compared to their counterpart's females (25 out of 67) represented by 37.3%. About 47.8% were between 41 and 50 years old, 20.9% of respondents were between the age of 21 and 30 years, 16.4% were between 31 and 40 years and 14.9% were those with 51 and above years. The findings indicated that both educated and non -educated were participated in Ngoma water supply projects as project beneficiaries, project implementers and other project stakeholders.

4.1 Presentation of Descriptive Findings

4.1.1 Project relevance and sustainability of community water project

As a part of post evaluation, this section reveals whether Ngoma water project was relevance in terms of considering government priorities, considering project beneficiaries needs, took into consideration project engagement during designing and implementation, or whether the methodology used were relevant enough. The findings are presented in Table 1.

Table 1: Project relevance and sustainability of community water project

statements	SD	D	N	A	SA	N	Mean	SD
1.Considering project beneficiaries' needs influence sustainability of community water project.	0%	1(1.5%)	0	25(37.3%)	41(61.2%)	67	4.58	0.581
2.Engaging project beneficiaries during designing and planning influence sustainability of community water projects.	0%	0%	3(4.5%)	26(38.8%)	38(56.7%)	67	4.52	0.587
3.Develop and implement a project with respect to the government priorities influence its sustainability.	0%	0%	1(1.5%)	21(31.3%)	45(67.2)	67	4.66	0.509
4.Emphasizing on methodology of implementing a project influence sustainability of community water project	0%	0%	9(13.4%)	30(44.8%)	21(41.8%)	67	4.28	0.692

Table 1 show findings on project re relevancy and sustainability of community water. With the strong mean of 4.58 and standard deviation of 0.581. The findings showed that 61.2% and 37.3% respectively strongly agree and agree that considering project beneficiaries needs influence sustainability of community water project. From the interview held with technical team at WASAC, they supported the findings by saying that in collaboration with local implementing partner (Ngoma district), WASAC has undertaken a situation analysis that aims to assess how relevant water was needed among the many priorities of the target population. The project beneficiaries expressed the need of clean water for domestic activities and also to cover the gap of water for their livestock and before construction of water supply systems, beneficiaries were

suffering from deficit of water, where they fetched pond water and unimproved springs. Ngoma water supply project was relevant to the target beneficiaries and to Ngoma district in general because they were solutions of water deficit issues observed within the district. Due to the project came to respond to the beneficiaries' needs is a basis for its sustainability because beneficiaries feel ownership and always preserve for continuous use (Vincent, 2023).

The study was also interested to acknowledge the link engaging project beneficiaries during designing and planning with the sustainability of community water projects. The results showed that 56.7% asserted with the statement, 4.5% were neither agree nor disagree with the statement and the respondents agreed with the statement at mean of 4.52 and standard deviation of 0.587. The findings have been supported by the report of United Nations High Commissioner for Refugees (UNHCR) in 2018 from the findings on the study that looked on the relationship between project engagement in designing and planning with its sustainability. Scope of the study covered community water systems provided in six counties Benin, Bolivia, Honduras, Indonesia, Pakistan and Uganda (UNHCR, 2018). The study also looked at the influence of developing and implementing a project with respect to the government priorities influence the sustainability of community water projects. The findings showed that, respondents agreed with the statement at mean of 4.66 a standard deviation of 0.509. In additional, about 21(31.3%) and 45(67.2) agree and strongly agreed with the statement, and 1.5% neither agree and disagree with the statement. Final, the study also assessed the extent to which emphasizing on methodology of implementing a project influence sustainability of community water project and the findings revealed that, respondents agreed with the statement at the mean of 4.28 and standard deviation of 0.692. The findings also showed that 41.8% strongly agree that emphasizing on methodology of implementing a project influence sustainability of community water project. The finding was supported by the report of National Institute of Statistics of Rwanda that said that Rwanda is a mountainous country which is difficult to always distribute water near to the population mainly in remote areas because population live in isolated settlement. However, paying attention to the methodology of implementing a water community project is one of the main influences of its sustainability and this has been mostly recommended to all actors this sector of distributing water to the community (NISR, 2020). The overall findings imply that, considering project beneficiaries' needs, engaging project beneficiaries during designing and planning, develop and implement a project with respect to the government priorities and emphasizing on methodology of implementing a project influence sustainability of community water projects. The calculated average mean is 4.51 and calculated average standard deviation is 0.592

4.1.2 Project Efficiency and Sustainability of community water projects

Efficiency is the ability to complete a task without wasting resources, time, money, energy, or other resources. In a broader sense, it is the capacity to carry out tasks successfully, and without wasting time. Therefore, during this post evaluation on Ngoma water supply project, researcher was interested to assess how effective allocation of resources, empowering project beneficiaries to use established water resources, ensure proper functioning of established infrastructure and considering project quality during implementation all influence sustainability of community water project.

Table 2: Project efficiency and sustainability of community water project

Statements	SD	D	N	A	SA	N	Mean	SD
1. Effective allocation of resources influences sustainability of community water project	0%	0%	2(3.0%)	22(32.8%)	43(64.2%)	67	4.61	0.549
2. Project beneficiaries empowered to use established water system influence sustainability of community water project	0%	3(4.5%)	4(6.0%	32(47.8%)	28(41.8%)	67	4.27	0.770
3.Ensure proper functioning of established infrastructure influence sustainability of community water project	0%	2(3.0%)	8(11.9%)	31(46.3%)	26(38.8%)	67	4.21	0.769
4.Considering project quality during implementation influence sustainability of community water project	1(1.5%	1(1.5%)	5(7.5%)	33(49.3%)	27(40.3)	67	4.25	0.785

Table 2 presents the findings regarding project relevancy and sustainability of community water projects. The study examined the influence of effective resource allocation on project sustainability and found that the respondents agreed with this statement, with a mean of 4.61 and a standard error of 0.549. A high proportion of respondents strongly agreed (64.2%) and agreed (32.8%) with the statement, emphasizing the importance of allocating resources efficiently and effectively. The success of the Water, Sanitation, and Hygiene (WASH) program in rural Ethiopia serves as an example of effective resource allocation. Community members were actively involved in all stages of the water supply system, leading to a high level of sustainability with over 90% of the systems still functioning after ten years (Foster et al., 2017). This success demonstrates the significance of resource allocation and community involvement in achieving long-term sustainability. During interviews with district officials, it was noted that effective resource allocation is crucial for project sustainability. Inadequate allocation of resources, particularly financial and human resources, can lead to project failure and have severe consequences for the community. Respondents from Ngoma water project also highlighted the importance of engaging beneficiaries in the project design and implementation to ensure optimal resource allocation and prevent overspending or underspending. The findings also revealed that empowering project beneficiaries significantly contributes to community water project sustainability. 41.8% strongly agreed, and 47.8% agreed with this statement, emphasizing the positive impact of community involvement and participation. When beneficiaries are actively engaged in project management and maintenance, they develop a sense of ownership, leading to improved system operation and maintenance.

https://doi.org/10.53819/81018102t3079

Empowering beneficiary's increases community contributions and support, making the project more sustainable in the long term (Acharya et al., 2020). However, it should be noted that 4.5% of respondents disagreed with the statement, highlighting the importance of considering the methodology of empowering beneficiaries based on the community's diverse backgrounds and mindsets. Nonetheless, the majority of respondents recognized the value of community involvement for sustainability. Regarding infrastructure, respondents agreed that ensuring proper functioning of established infrastructure influences sustainability, with 38.8% strongly agreeing and 46.4% agreeing. Adequate water infrastructure is crucial for accessing safe and reliable water supplies. However, it is important to note that 3.0% disagreed with the statement, suggesting that infrastructure alone may not guarantee sustainability if issues such as seasonal water production or poor water quality persist. Lastly, the study examined the extent to which considering project quality during implementation influences sustainability. Respondents agreed with this statement, with a mean of 4.25. They recognized that poor quality implementation can lead to system failure, inadequate water supply, and poor water quality, impacting community health and well-being. Effective project implementation involves using appropriate technology, skilled manpower, and proper management practices. Community involvement and participation are also essential for ensuring that the project meets their needs and is sustained over the long term.

4.1.3 Project effectiveness and sustainability of community water projects

Effectiveness refers to the degree to which something is successful in producing a desired result. It is for this regard that, this post evaluation on factors leading to sustainability of Ngoma water project came across the point of effectiveness. Under effectiveness, Table show the analyzed attributes.

Table 3: Project effectiveness and sustainability of community water projects

Statement	SD	D	N	A	SA	Mean	SD
1.Ensuring that the constructed water supply systems is accessible and near to the beneficiaries influence sustainability of community water project	0%	0%	0%	11(16.4%)	56(83.6)	4.45	0.585
2.Ensuring that water is available any time needed in the taps influences sustainability of community water projects	0%	0%	3(4.5%)	31(46.3%)	33(49.3%)	4.72	0.454
3.Ensuring that water that is supplied is clean influence sustainability of community water project	0%	0%	0%	19(28.4%)	48 (71.6%)	4.84	0.373
4.Ensuring that water provided is affordable to target beneficiaries influence its sustainability of community water project	0%	0%	6(9.0%)	11(16.4%)	50(74.6%)	3.93	0.785

The findings of the data analysis revealed that a significant majority of the respondents (83.6% and 16.4%) strongly agreed and agreed, respectively, that the accessibility and proximity of the constructed water supply systems to the beneficiaries have a strong influence on the sustainability of community water projects. The respondents emphasized that well-designed and easily accessible water supply systems promote regular usage and maintenance, ensuring the longevity of the systems. Additionally, community water projects located closer to the communities showed higher levels of participation and community involvement, leading to more sustainable systems. In addition, a considerable percentage (49.3%) strongly agreed that ensuring water availability at all times in the taps is crucial for the sustainability of community water projects. Similarly, a majority (71.6%) agreed that the provision of clean water has a significant impact on project sustainability, while 74.6% asserted that affordability of the water provided influences its sustainability. The respondents explained that inadequate water supply, such as intermittent flow or low pressure, poses a significant challenge to project sustainability. They emphasized that reliable and sufficient water availability is vital for maintaining and sustaining community water projects in the long run, as it instils a sense of safety and security among the communities.

Moreover, when water is not clean, it can lead to various health problems, including waterborne diseases, which can be fatal. Consequently, people may stop using the water supply or seek alternative sources, negatively affecting the sustainability of the community water project. The provision of clean water is not only crucial for community health and well-being but also contributes to overall sustainable development, aligning with the 6th Sustainable Development

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Journal of Entrepreneurship & Project management
Volume 7||Issue 2||Page 42-63||May||2023|
Email: info@stratfordjournals.org ISSN: 2616-8464

Goal. Further, ensuring that the provided water is affordable to the target beneficiaries plays a critical role in the sustainability of community water projects. Affordability determines the level of usage and the willingness of beneficiaries to pay for the service. When water is provided at an affordable price, beneficiaries are more likely to use it regularly, increasing demand and generating more revenue for the project. Conversely, if water is not affordable, beneficiaries may not be willing to pay, resulting in low demand and reduced project revenue. Affordable water services can also have positive health impacts. The calculated average mean was 4.48, and the standard deviation was 0.549. These findings align with previous research by Mdemu et al. (2016), which demonstrated the influence of household income and water tariff affordability on willingness to pay for rural water supply in Tanzania. The World Health Organization (WHO) and the United Nations Children's Fund (UNICEF) also highlight the importance of financial sustainability and affordability for community water projects.

4.1.4 Indicators of community water sustainability

One of the main and desired outcomes for every project implemented relies on its sustainability after its completion. This study has identified indicators, which prove the sustainability of a water community projects, water is available any time needed in the taps, available water is also affordable to every target beneficiary, established water system continued functioning without intervention of project initiator and water supply regularly maintained and leakages timely repaired. The table 4.6 illustrates how the respondents ranked these indicators according to their views.

Table 4: Indicators of community water sustainability

Statement	SD	D	N	A	SA	Mean	SD
Water is available any time needed in the taps.	0%	0%	0%	6(9.0%)	61(91.0%)	4.45	0.585
Available water is also affordable to every target beneficiary	0%	0%	0%	11(16.4%)	56(83.6%)	4.72	0.454
Established water system continued functioning without intervention of project initiator	0%	0%	0%	13(19.4%)	54(80.6%)	4.84	0.373
Water supply system regularly maintained and leakages timely repaired	0%	0%	0%	20(29.9%)	47(70.1%)	4.91	0.288

This study identified indicators which proved sustainability of community water projects Therefore, the analysed indicators of sustainability of community water projects were water is available anytime needs in the taps, available water is also affordable to every target beneficiary, established water system continued functioning without intervention of project initiator and water supply system regularly maintained and leakages timely repaired. The findings showed that on the indicator of available water anytime in the taps, respondents agreed with at the mean of 4.45 and standard deviation of 0.585. About strongly agreed with the indicator and 9.0% agreed with the statement. On the indicator of available water is also affordable to every target beneficiary. The respondents agreed with the statement at the mean of 4.72 and standard deviation of 0.454.

Stratford Peer Reviewed Journals and Book Publishing
Journal of Entrepreneurship & Project management
Volume 7||Issue 2||Page 42-63||May||2023|
Email: info@stratfordjournals.org ISSN: 2616-8464

About 83.6% strongly agreed with the statement and 16.4% agreed with the statement. On the indicator of established water system continued functioning without intervention of project initiator. Respondents agreed with the statement at the mean of 4.84 and standard deviation of 0.373. About 80.6% strongly agreed with the statement and 19.4% agreed with the statement. Finally, on the indicator of water supply system regularly maintained and leakages timely repaired. Respondents agreed on the statement at mean of 4.91 and standard deviation of 0.288. About 70.1% strongly agreed with the statement and 29.9% agreed with the statement. The overall findings imply that, it is always important to consider whether water is available anytime needs in the taps, available water is also affordable to every target beneficiary, established water system continued functioning without intervention of project initiator and water supply system regularly maintained and leakages timely repaired

4.2 Correlation analysis

Researcher applied correlational analysis to measure the relationship between independent variables and dependent variable. Independent variables were considering project relevancy, project efficiency and project effectiveness during post evaluation of community water projects while dependent variable was sustainability of community water projects. Table 4.7 illustrates the findings.

Table 5: Correlation matrix

		Project relevancy	Project efficiency	Project effectiveness	Project sustainability
Project relevancy	Pearson Correlation	1			
	Sig. (2-tailed)				
	N	67			
Project efficiency	Pearson Correlation	.406**	1		
	Sig. (2-tailed)	.000			
	N	67	67		
Project effectiveness	Pearson Correlation	.314**	.112**	1	
	Sig. (2-tailed)	.000	.000		
	N	67	67	67	
Project sustainability	Pearson Correlation	.726 **	.814**	.611**	1
	Sig. (2-tailed)	.000	.000	.000	
	N	67	67	67	67

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

The table 5 indicates how independent variables correlated with dependent variable, the results showed that there is high positive relationship between post evaluation indicators and sustainability of community water projects. The analyzed indicators are project relevancy, project efficiency and project effectiveness. Project relevancy has 0.814 correlations with

sustainability of community water project. Project effectiveness has 0.611 with sustainability of community water projects and project efficiency has 0.814 with sustainability of community water projects. This implies that, it is always vital to consider the attributes of project relevancy, project effectiveness and project efficiency during implementation of community water projects to ensure the project should sustain.

4.3 Regression analysis

This section illustrates the relationship between independent variable which is post project evaluation indicators and dependent variable which is projects performance implemented by international organizations. Analysis was done using regression linear to find out the influence of considering project relevancy, project effectiveness and project efficiency and sustainability of community water projects

Table 6: Model summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.889[a]	.876	.792	.32398

The findings show that R Square is high which indicates high contribution of independent variables to dependent variables and Adjusted R Square shows that the considering project relevancy, project efficiency and project effectiveness contributes up to 79.2% to the sustainability of community water projects.

Table 7: Regression coefficients

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	19.629	1.173		9.034	.000
	Effectiveness	.647	.120	-.036	-.226	.000
	Efficiency	.510	.064	-.171	-.934	.000
	Relevancy	.364	.099	.098	.647	.002

Regression line is equal to 19.629+0.647x1+0.510x2+0.364x3+0.32398 whereby x1 is project effectiveness, x2 is project efficiency and x3 is project relevancy. The findings indicated that investing ineffectiveness of implementing a community water contributes up to 64.7% to its sustainability similar to looking at efficiency which contribute up 51.0% to the sustainability while scrutinizing project relevancy contribute up to 36.4%.

5.0 Conclusion

Regarding to the first objective which investigated project relevance and sustainability of community water project in Ngoma district, based on the collected data, the study concluded that, considering project beneficiaries' needs, engaging project beneficiaries during designing

and planning, develop and implement a project with respect to the government priorities and emphasizing on methodology of implementing a project influence sustainability of community water projects shown by average mean of 4.51 who agreed with these statements and at 0.592. With respect to the second objective, the study concluded that effective allocation of resources, project beneficiaries empowered to use established water system, ensure proper functioning of established infrastructure and considering project quality during implementation influence sustainability of community water projects whereby the respondents supported the statement at the average mean of 4.33 and average stand devition of 0.718. Finally, the study concluded on the last objective which examined the project effectiveness and sustainability of community water project in Ngoma district that ensuring that the constructed water supply systems is accessible and near to the beneficiaries, ensuring that water is available any time needed in the taps, ensuring that water that is supplied is clean and ensuring that water provided is affordable to target beneficiaries could significantly contributes to the sustainability of community water projects. Respondents have supported the arguments at the average mean of 4.48 and average standard deviation is 0.549

6.0 Recommendations

Based on the collected data that aimed to respond general and specific objectives of this study which was to investigate project relevance, project efficiency and project efficiency as indicators to consider in community water projects post evaluation and its sustainability. The study concludes with the following major recommendations:

Community water projects are recommended to always consider project relevancy, project effectiveness and project efficiency to ensure its sustainability;

i. Due to Rwanda is a mountainous country, the study recommends community water project initiators to invest in method of implementing the project for sustainability purpose;

ii. As a part of project relevancy, the study recommends similar projects to involve community water project beneficiaries from design to implementation in order to raise their ownership;

iii. The study recommends community water projects to ensure that water is available anytime needs in the taps, available water is affordable to every target beneficiary, established water system continued functioning without intervention of project initiator and water supply system regularly maintained and leakages timely repaired as indicators of community water project sustainability

For sustainability purpose, community water project beneficiates requested regularly trainings on proper management of established water infrastructure.

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