



## The influence of resource planning practices in faecal sludge management system in Embu County

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### ABSTRACT

#### KEYWORDS

*Resource planning*  
*Sanitation practices*  
*Faecal sludge management*

The study aimed to assess the influence resource planning influences the implementation of a faecal sludge management system in Embu County between March and December 2022, adopting a descriptive research design. The population included 655 individuals, with a sample size determined using Taro Yamane's formula for landlords and a census method for top managers, technical officers, contractors, and individuals involved in exhausting. Research instruments comprised scheduled questionnaires and interviews, with ethical considerations obtained from relevant authorities. Data analysis utilized SPSS Version 26 for both

qualitative and quantitative data, employing thematic analysis for qualitative data and descriptive and inferential analyses for quantitative data. Findings revealed a notable gender imbalance and age-related impacts on perceptions in fecal sludge management. Resource planning effectiveness indicated strengths in objective setting, communication, and risk management, significantly influencing system implementation. Recommendations include strengthening the strategic framework, enhancing vision and mission statements, refining financial planning, addressing role comprehension gaps, aligning resource planning with project timelines, and implementing regular monitoring and evaluation for ongoing improvements. Overall, the study emphasizes the pivotal role of resource planning in the success of fecal sludge management projects and highlights areas for improvement to enhance effectiveness.

#### Introduction

The global perspective on fecal sludge management (FSM) underscores the significance of effective resource planning and implementation (Sanivation, 2023). For instance, European countries like the Netherlands and Switzerland have made notable advancements in FSM through comprehensive resource planning and sustainable treatment technologies (Sanivation, 2023). Simi-

larly, the United States and Canada in the Americas have implemented robust FSM systems, integrating innovative resource planning strategies to ensure environmental and public health protection (Sanivation, 2023). In Kenya, the management of faecal sludge (FS) poses a significant challenge due to inadequate sanitation facilities and infrastructure, leading to improper disposal of FS (Kibria, 2019). The lack of adequate FS treat-

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ment and disposal facilities exacerbates the situation, resulting in the indiscriminate dumping of untreated FS into the environment, causing significant health and environmental risks (Ondieki, 2019).

Influence Resource Planning (IRP) is an essential tool that can enhance the implementation of a faecal sludge management system by identifying and allocating resources required to implement a project (GOK, 2016). According to the Water Sector Trust Fund (2018), only 20% of Kenyans have access to basic sanitation facilities, leaving a large proportion of the population without safe sanitation services. Consequently, many people rely on pit latrines, which require frequent desludging (Mwirigi, 2018). However, only 10% of the FS generated from pit latrines is safely managed, exacerbating health and environmental risks (Mwirigi, 2018). The indiscriminate dumping of untreated faecal sludge into the environment poses significant health and environmental risks, including contamination of groundwater sources and pollution of surface water bodies (Makworo, 2018; Mutua, 2019). Therefore, there is an urgent need to implement a comprehensive faecal sludge management system in Kenya (GOK, 2017).

In Kenya, the advancement of circular sanitation models highlights the critical role of effective collaboration and meticulous planning in the implementation of FSM (USAID, 2019). Moreover, the commitment to sound faecal sludge management practices emerges as a focal point in various Kenyan counties, including Embu County, as part of overarching initiatives to bolster sanitation and environmental well-being (USAID, 2019). Within the Kenyan context, the Bottom-Up Economic Transformation Agenda (BETA) and the Fourth Medium-Term Plan serve as instrumental frameworks guiding the nation's developmental pursuits, encompassing efforts in sanitation and hygiene programs (USAID, 2022). These national agendas align seamlessly with the global Sustainable Development Goals (SDGs), particularly Goal 6, which strives to ensure universal access to clean water and sanitation (USAID, 2022). The

integration of BETA, the Fourth Medium-Term Plan, and the SDGs into the planning and execution of faecal sludge management systems is imperative for fostering economic growth, environmental sustainability, and advancements in public health, especially at the county level, as observed in Embu County, Kenya (Water Sector Trust Fund, 2017).

#### *Problem statement*

The sewage disposal challenge in Embu town persists despite the community's development, as highlighted in the strategic plan of Embu Water and Sanitation Company Ltd. (EWASCO) (EWASCO, 2017-2022). Despite the installation of a wastewater treatment plant, EWASCO faces difficulties in managing faecal sludge, necessitating the proposed wastewater treatment system project undertaken by EWASCO as the proponent and agent of the Tana Water Works Development Agency (TWWDA) (EWASCO, 2017-2022). However, organizational and managerial challenges persist, leading to suboptimal outcomes in sanitation projects, including coordination problems, cost overruns, and inadequate stakeholder management (Kwak, 2012; Ahsan & Gunawan, 2010; Dvir et al., 2013). Yusuf's (2020) study emphasizes the crucial role of monitoring and evaluation (M&E) procedures in project success, revealing a strong association between project success and various aspects of monitoring (Yusuf, 2020). Despite these insights, Kenya faces numerous project management challenges, as reported by the World Bank (2015), attributing failure to poorly coordinated execution strategies, insufficient participatory evaluation, and inadequate resource planning (World Bank, 2015). The research aims to fill the gap in understanding how resource planning influences the implementation of a faecal sludge management system in Embu County, contributing valuable insights to enhance sanitation initiatives (EWASCO, 2017-2022; Yusuf, 2020; World Bank, 2015).

### Research Objectives

- i) Evaluate the effectiveness of the existing resource planning strategies employed in the fecal sludge management system in Embu County.
- ii) Identify and analyze any gaps or challenges in the current resource planning that may impede the successful implementation of the fecal sludge management system.

### Research Questions

- i) How effective are the current resource planning strategies employed in the fecal sludge management system in Embu County?
- ii) What specific gaps or challenges exist in the current resource planning that could potentially hinder the successful implementation of the fecal sludge management system in Embu County?

### Literature Review

#### *Resource Planning of fecal sludge management practices projects*

The process of project planning involves selecting optimal strategies, coordinating activities, and managing finances to enhance the likelihood of successful programs (Sullivan et al., 2022). Local strategic planning, as highlighted in Botchie's (2021) research on rural district planning in Ghana, necessitates a systematic approach involving an evaluation of existing systems, administrative duties, and needs assessments to address rural planning challenges effectively. Similarly, Weiss and Wysocki (2021) emphasize the significance of gathering data on natural resources and socio-economic factors for informed decision-making in planning processes.

Challenges identified in project planning, as supported by Hedman (2002), underscore the need for long-term commitments, investments in planning, capacity building, and expertise to overcome subpar planning practices and achieve favorable project outcomes. Multiple Release Custom's (2015) study on project planning stages in Britain stresses the importance of schedule man-

agement strategies and project planning's crucial role in project success, despite the study's limitation in fully expressing planning's significance beyond paperwork.

Project planning significantly impacts project performance, as evidenced by Idoro (2012) and Atwell (2016). However, challenges arise when planning overlooks implementers' needs, leading to poor outcomes, as observed in Dinka et al.'s (2010) study on Indigenous Chicken projects in Ethiopia. Research by Lemma (2014) and Isidoro (2012) highlights various factors influencing project performance, emphasizing the need for comprehensive planning addressing human, management, and technical components.

Resource mobilization is essential for project execution, with studies revealing its critical role in project practices across African countries (World Bank, 2013). Delayed resource mobilization negatively impacts project completion, underscoring the importance of creating resource plans and providing training in resource mobilization strategies, as suggested by Okeyo, Rambo, and Odundo (2015) and Musundi (2015). These studies collectively emphasize the significance of stakeholder involvement, resource availability, and timely resource mobilization in project success.

### Methodology

The research focuses on evaluating fecal sludge management practices in Embu County, situated in the eastern region of Kenya, with Embu Town as its administrative center. The county's diverse urban and rural settings present a dynamic context for examining fecal sludge management, influenced by its geographical characteristics such as undulating terrain, rivers, and streams. Urbanization in Embu Town and distinct sanitation challenges in rural areas contribute to the complexity of fecal sludge management. Economic activities like agriculture, trade, and services also impact waste generation patterns. The administrative structure plays a crucial role in shaping policies and regulations related to fecal sludge management. The study employs a descrip-

tive research design to thoroughly investigate existing conditions and project management methods in fecal sludge management, ensuring a detailed description with minimal bias. The target population comprises 5 top managers, 10 technical officers, 2 contractors, 3 individuals involved in exhausting, and 635 landlords, totaling 655 individuals, and the sample size for landlords was determined using Taro Yamane's formula.

$$n = N / (1 + Ne^2) \text{ Where:}$$

n is the sample size

N is the population size

e is the level of precision (margin of error)

$$n = 635 / (1 + 635 * (0.05)^2)$$

Calculate the sample size:

$$n = 635 / (1 + 635 * (0.0025)) \approx 149 \text{ landlords}$$

The study involved 5 top managers, 10 technical officers, 2 contractors, and 3 individuals in exhaust, totaling 20 respondents due to the small population, hence adopting a Census method for sampling. Stratified sampling was used to ensure representation, dividing the population into homogeneous subgroups. Research instruments included scheduled questionnaires for landlords and interviews with top managers and contractors, designed logically based on study goals. Ethical considerations included obtaining permission and consent from relevant authorities, while data analysis involved SPSS Version 26 for both qualitative (thematic analysis) and quantitative (descriptive and inferential) data. Top of Form

## Results

### Questionnaire Return rate.

A total of 127 questionnaires were returned out of 169 administered to contractors, landlords, individuals in exhausting and project managers, resulting in a response rate of 81%.

### Social Demographic Characteristics

The study examined the gender distribution among respondents, revealing a notable representation of both men and women. Out of the total 127 respondents, 82 were men, constituting 65% of the sample, while 45 were women, making up 35% of the sample. This distribution highlights a gender imbalance, with men being the majority in the study.

The gender imbalance in the respondents could influence the perceptions and experiences captured in the study, potentially reflecting a more male-centric perspective on fecal sludge management in Embu County. Understanding the demographic composition is crucial for contextualizing findings and ensuring a comprehensive view of the community.

*Age Distribution:* The age distribution of respondents was categorized into four groups: 25-35, Under 25, 46-55, and Over 55. The largest age group was 25-35, comprising 64 respondents, representing 50.6% of the total sample. The second-largest group was 46-55, with 26 respondents, account-

Gender	Respondents	Percentage
Men	82	65
Women	45	35
<b>Total</b>	<b>127</b>	<b>100</b>

**Table 1:** Gender of respondents

Age	Respondents	Percentage
25-35	64	50.6%
Under 25	21	16.1%
46-55	26	20.7%
Over 55	16	12.6%
<b>Total</b>	<b>127</b>	<b>100</b>

**Table 2:** Age of respondents

Descriptive Statistics					
	N	Minimum	Maximum	Mean	Std. Deviation
Objectives are set	127	3.00	5.00	4.0230	.50379
Objectives are communicated to project members	127	3.00	5.00	4.1092	.67544
Projects have vision and mission statements	127	2.00	4.00	3.6437	.67963
All employees understand their roles and responsibilities	127	2.00	5.00	3.7931	1.12397
Budgets are always set before the start of the projects	127	3.00	4.00	3.7126	.45384
Projects have operational risk management plans	127	4.00	5.00	4.1207	.32671
Projects have operational action/strategic plans	127	4.00	5.00	4.0632	.24406
Valid N (listwise)	127				

**Table 3:** Resource Planning Influence on Fecal Sludge Management Practices

ing for 20.7%. Meanwhile, the Under 25 and Over 55 groups had 21 (16.1%) and 16 (12.6%) respondents, respectively

The age distribution implies that the majority of respondents fall within the 25-35 age range. This may suggest that the perspectives and experiences of this age group could have a more significant impact on the overall findings, potentially influencing the perceptions of resource planning and its implications for fecal sludge management in Embu County.

#### *Descriptive Analysis of Resource Planning in Fecal Sludge Management System*

In evaluating the resource planning strategies within Embu County's fecal sludge management system, various key indicators were examined. The mean values derived from the assessment offer valuable insights into the effectiveness and potential areas for improvement in resource planning.

The study findings indicate that resource planning in Embu County's fecal sludge management system is generally effective, with strengths in clear objective setting (Mean: 4.0230), robust communication of objectives (Mean: 4.1092), and proactive operational risk management plans (Mean: 4.1207). These aspects contribute to coordinated efforts and goal-oriented execution of fecal sludge management initiatives. However, there is room for improvement in articulating explicit vision and mission statements (Mean: 3.6437) to provide a more strategic direction and ensuring a clearer understanding of employee roles (Mean: 3.7931) for optimizing team performance. While budgets are reasonably set before project initiation (Mean: 3.7126), further review may enhance financial planning and resource allocation. Overall, these insights offer valuable foundations for strategic interventions to further optimize resource planning and ensure the successful

Model	R	R Square	Adjusted R Square	Std. An error of the Estimate
1	0.877 <sup>a</sup>	0.770	0.742	0.381
a) Dependent Variable; Implementation of a fecal sludge management system				
b) Predictors: (Constant); Objectives Setting; Communication of Objectives; Vision and Mission Statements; Employee Understanding of Roles; Budget Setting Operational Risk Management Plans; Operational Action/Strategic Plans				

**Table 4:** Model summary

implementation of the fecal sludge management system in Embu County.

#### Regression analysis

##### Model Summary of combined independent variables

In the presented inferential results (Table 4), a multiple regression analysis was conducted with Resource Planning as the independent variable and the dependent variable being the Implementation of a fecal sludge management system

##### Table 4. Model Summary

The multiple regression analysis findings hold significant implications for implementing a fecal sludge management system in Embu County, indicating that key factors within resource planning collectively influence success. With a 77% explanation of implementation variability, the model is robust, as shown by an adjusted R squared value of 74%, ensuring accurate capture of resource planning's relationship with system implementation. A small standard error of estimate (0.381) boosts model credibility, indicating precise predictions for decision-makers. Each predictor variable, including Objectives Setting, Communication of Objectives, Vision and Mission Statements, Employee Understanding of Roles, Budget Setting, Operational Risk Management Plans, and Operational Action/Strategic Plans, significantly contributes to implementation variation, emphasizing their crucial role in resource planning for optimal system implementation

##### Coefficient estimate

The results of quantitative data were further subjected to regression analysis

$$Y = \beta_0 + \beta_1 X_1 + \alpha$$

Where: Y= Implementation of a fecal sludge management system

$\beta_0$  = Y-intercept

$X_3$  = resource planning

$\alpha$  = random error (presumed to be 0.)

The coefficient estimate (0.979) affirms resource planning's crucial role in fecal sludge management system implementation, indicating that enhanced planning correlates with increased implementation success. This underscores the criticality of effective resource planning for the successful establishment and operation of the system in Embu County.

##### Interview Responses on Resource Planning for Fecal Sludge Management Projects in Embu County, Kenya:

Interview responses from various stakeholders involved in fecal sludge management projects in Embu County, Kenya, underscore the critical role of resource planning in project success. Successes in improving sanitation conditions were attributed to the effective implementation of technologies and collaboration with stakeholders. Allocation of resources to the Monitoring and Evaluation Team was emphasized by Interviewees 7 and 8, highlighting its importance in conducting assessments and data analysis. Interviewee 4 highlighted the dependence of project practices on monitoring and evaluation skills, emphasizing the need for strategic resource allocation to support these efforts. Interviewee 3 discussed the importance of timely task execution and the alignment of resource planning with project schedules to ensure efficiency. Thematic analysis across interviews further emphasized the pivotal role of resource planning, from technology implementation to supporting monitoring and evaluation activities, in achiev-

Coefficients					
Model		Unstandardized Coefficients		Standardized Coefficients	t
		B	Std. Error	Beta	
1	(Constant)	5.385	.323		16.688
	Resource Planning	.979	.108	1.192	9.069

a. Dependent Variable: Implementation of a fecal sludge management system

**Table 5:** *Coefficient estimate*

ing project success. These insights stress the need for continued emphasis on strategic resource allocation in project management strategies to ensure effective fecal sludge management in Embu County.

### Discussion and Implications of Findings:

The evaluation of resource planning strategies in Embu County's fecal sludge management system provides valuable insights into project planning, management, and success, aligning with existing literature (Sullivan et al., 2022). The study's findings resonate with the importance of effective project planning in achieving successful outcomes, as highlighted by Botchie (2021), emphasizing systematic approaches and thorough assessments of resources and needs. Challenges related to planning, acknowledged by Hedman (2002), find resonance in the present study's emphasis on the consequences of inadequate planning, stressing the necessity for long-term commitment and resource allocation. Integration of planning with other management strategies, such as monitoring and evaluation, aligns with the interconnected nature of these components highlighted in the UK context (Multiple Release Custom, 2015).

Stakeholder engagement in fecal sludge management is crucial, as indicated by various studies (Atwell, 2016; Dinka et al., 2010), complementing Lemma's (2014) study on project planning's impact on project performance in Ethiopia. The emphasis on improved project delivery contributing

to enhanced performance (Isidoro, 2012) reinforces the link between effective planning and project success, echoing the present study's emphasis on explicit vision and mission statements and robust communication of objectives. Resource mobilization, critical for project practices, is highlighted in studies indicating negative impacts of funding gaps (Atwell, 2016), aligning with the present study's identification of areas for improvement in financial planning and the importance of sustained proactive risk management plans (Okeyo, Rambo, & Odundo, 2015; Musundi, 2015). Addressing identified strengths and areas for improvement in resource planning offers practical implications for project practitioners and policymakers in Embu County, including strengthening explicit vision and mission statements, addressing gaps in role comprehension, and continuous improvement in financial planning and budget setting to enhance resource allocation efficiency.

### Conclusion

The evaluation of current resource planning strategies for fecal sludge management revealed commendable strengths, including effective objective setting, clear communication, and robust risk management. However, areas for improvement were identified, such as the need to strengthen vision and mission statements for better strategic direction, refine financial planning processes to optimize resource allocation, and address gaps in role comprehension among employees. Delays in task execution highlighted the

importance of aligning resource planning with project schedules. Thematic analysis emphasized the pivotal role of resource planning in project success, highlighting the importance of technology implementation and stakeholder involvement for improved sanitation conditions.

### Recommendations

To improve the fecal sludge management system, it is recommended to first strengthen the strategic framework by refining objectives and ensuring alignment with the mission. Additionally, enhancing vision and mission statements will provide a stronger foundation for resource planning. Financial planning processes should be refined through a comprehensive review, focusing on budget setting, allocation, and management to enhance resource utilization efficiency. Addressing role comprehension gaps among employees through targeted training or communication strategies will improve clarity of responsibilities and contribute to effective resource planning. Aligning resource planning with project timelines will minimize delays and ensure efficient allocation of resources. Finally, implementing a robust monitoring and evaluation system will enable timely identification of gaps and facilitate necessary improvements in resource planning strategies.

### Reporting and Ethical Guidelines

The study adhered to ethical guidelines by obtaining informed consent, maintaining confidentiality, minimizing harm, obtaining ethical clearance, and ensuring transparent and accurate reporting to protect participants' rights and well-being while conducting research on fecal sludge management in Embu County.

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