


BINDURA UNIVERSITY OF SCIENCE EDUCATION

FACULTY OF AGRICULTURE AND ENVIRONMENTAL SCIENCE

DEPARTMENT OF ENVIRONMENTAL SCIENCE

Acceptability of ecological sanitation in ward 14, Guruve district, Zimbabwe

By

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A dissertation submitted in partial fulfilment of the requirements of a Bachelor of Environmental Science Honours degree in Safety, Health and Environmental management

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Declaration

To be compiled by the student:

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I Samuel Magomo do hereby declare that this work is entirely the product of my own findings and has never been presented to any academic institution. Any reference to previously published work has been clearly indicated.

Signature of the student……Date **30 May 2023**

To be compiled by the supervisor:

This dissertation is suitable for submission to the faculty and has been checked for conformity with the faculty guidelines.

Signature of supervisor:  Date: **30 May 2023**

Abstract

Background: The provision of safe and sustainable sanitation is a critical public health issue, particularly in low- and middle-income countries. This study aims to explore the acceptability of ecological sanitation (ecosan) in Ward 14, Guruve District, Zimbabwe, and to identify the factors influencing the preference for ecosan latrines in rural communities.

Materials and Methods: A cross-sectional survey was conducted in 292 households in Ward 14, Guruve District, Zimbabwe. A structured closed-ended questionnaire was used to collect data on household demographics, knowledge of ecological sanitation, preference for different types of latrines, and factors that influence the preference for ecosan latrines. Multinomial logistic regression analysis was used to identify significant determinants of the preference for ecosan latrines.

Key findings: The study found that less than 25% of households in Ward 14, Guruve District, Zimbabwe did not prefer ecosan latrines. Lack of knowledge about ecosan and cultural beliefs were the main reasons for not preferring ecosan latrines. Factors that significantly influenced the preference for ecosan included the source of income, cost of construction materials, security, marital status, length of stay in the area (>10 years), knowledge about ecosan, built in difficult environments, and cost of construction materials.

Conclusions: Sanitation interventions in rural communities should be tailored to the specific needs and preferences of different households. Education and awareness-raising campaigns may be effective in promoting the adoption of ecosan latrines. Culturally appropriate, costeffective, and easy-to-maintain latrines should be selected for sustainability. Further, community participation and education are critical for the adoption of latrines. The health impacts of adopting a specified latrine option may be studied in future work.

Key terms: ecosan; community participation; cost-effective; culturally acceptable; rural sanitation

Dedication

This study is dedicated to my family and friends for their phenomenal love, care, and support.

Acknowledgments

Firstly, I thank God for giving me the strength to continue even during hard times. Secondly, I thank my loving parents for their never-ending support and encouragement. My appreciation also goes to my siblings, Chido, Yollanda, Ropafadzo, and Kupakwashe Magomo. My utmost gratitude to my supervisor Dr. A. Kanda for all his support, intellectual guidance, and encouragement throughout the course of the study. I appreciate the amount of dialogue that he allowed between us during which I was able to profit from his experience and knowledge of research. Special thanks to my friends for their support.

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Acronyms

Ecosan	Ecological sanitation
UNICEF	United Nations International Children's Emergency Fund
VHW	Village Health Worker
WHO	World Health Organization
ZimStats	Zimbabwe National Statistics

CHAPTER 1: INTRODUCTION

1. INTRODUCTION

1.1 Background of the study

Access to safe and adequate sanitation is a fundamental human right that is essential for promoting public health and preventing the spread of waterborne diseases. However, in many rural areas of Zimbabwe, access to safe sanitation is limited, and open defecation is common (WHO and UNICEF. 2022). Poor sanitation significantly threatens public health, spreading waterborne diseases such as cholera, typhoid, and diarrhoea (Nhamo et al., 2019). Ecological sanitation (ecosan) is an innovative approach to sanitation that promotes the use of natural processes to treat human waste and recycle nutrients (Banamwana et al., 2022). Ecosan has been successfully implemented in several countries worldwide, yet its acceptability in rural areas of Zimbabwe remains largely unknown.

In Zimbabwe, rural areas are characterized by low levels of infrastructure development, limited access to clean water, and inadequate sanitation facilities (Siziba and Saruchera, 2019). The government and non-governmental organizations have made efforts to improve access to sanitation, but progress has been slow due to limited resources and a lack of awareness and acceptance of alternative sanitation technologies (Mawere and Chigwada, 2015). Ecosan offers a sustainable and cost-effective solution to the sanitation challenges facing rural areas in Zimbabwe, but its success relies heavily on the acceptance and adoption of the technology by rural communities.

Therefore, there is a need to assess the acceptability of ecological sanitation in rural areas in Zimbabwe. The study aimed to provide insights into the factors that influence the acceptability

of ecosan in rural communities and to identify the barriers and facilitators to its adoption. By understanding the perceptions and attitudes of rural communities towards ecosan, the findings from this study can inform the development of policies and strategies to promote its adoption and contribute to efforts towards achieving universal access to safe and adequate sanitation in Zimbabwe.

1.1 Problem statement

Ecological sanitation pilot projects were implemented in several locations in Zimbabwe, but there has been limited evaluation of rural residents' perception and acceptance of these technologies (Kanda et al., 2023). The Zimbabwean government has proposed the introduction of new sanitation techniques to address the sanitation problem in rural areas, but the success of such interventions depends on the acceptability and adoption of the technology by rural communities. The introduction of ecological sanitation (ecosan) technologies has been proposed as a sustainable solution to the sanitation challenges facing rural areas in Zimbabwe (Kabundu et al., 2022). However, their acceptability and adoption are not yet fully understood. The success of these interventions depends on the perceptions and attitudes of rural communities towards these technologies. The lack of awareness and acceptance of alternative sanitation technologies in rural areas of Zimbabwe has hindered progress toward achieving universal access to safe and adequate sanitation (Kanda et al., 2022). By understanding the factors that influence the acceptability of ecosan in rural communities, this study can inform the development of policies and strategies to promote its adoption and contribute to efforts toward achieving universal access to safe and adequate sanitation in Zimbabwe.

1.3.1 Aim

The study aims to understand the perceptions and potential acceptability of ecological sanitation in Ward 14, Guruve rural district, Zimbabwe.

1.3.2 Specific objectives

1 To determine perceptions of rural communities on ecological sanitation in Ward 14, Guruve district, Zimbabwe.

2 To determine factors that influence the acceptance of ecological sanitation as a sanitation technology of choice by rural communities in Ward 14, Guruve district, Zimbabwe.

1.4 Significance of the study

The significance of this study lies in its potential to inform the development of policies and strategies to promote the adoption of ecological sanitation technologies in rural areas of Zimbabwe, based on the findings of the perceptions and attitudes of rural communities towards Ecosan (Banamwana et al., 2022). The success of ecosan technologies in addressing the sanitation challenges facing rural areas depends on their acceptability and adoption by rural communities. By identifying the barriers and facilitators to its adoption, the study can inform the development of interventions to promote its uptake and ensure sustainable and effective sanitation solutions in rural areas of Zimbabwe.

The study findings can contribute to efforts toward achieving universal access to safe and adequate sanitation in Zimbabwe, a basic human right. Poor sanitation poses a significant threat to public health, spreading waterborne diseases such as cholera, typhoid, and diarrhoea (WHO/UNICEF. 2022). Ecosan technologies offer a sustainable and cost-effective solution to the sanitation challenges facing rural areas in Zimbabwe, but their success relies heavily on the acceptance and adoption of the technology by rural communities. The findings of this study can, therefore, inform the development of policies and strategies to promote the adoption of

ecosan technologies, contributing to efforts towards improving public health outcomes in rural areas of Zimbabwe.

1.5 Research questions

1 What are the perceptions and attitudes of rural communities towards the use of ecological sanitation (ecosan) technologies?

2 What are the factors that influence the acceptability of Ecosan technologies in rural areas of Zimbabwe?

1.6 Assumptions

- Rural residents in Zimbabwe may have cultural and traditional beliefs that affect their perception and acceptance of ecological sanitation technologies

- Availability of resources such as materials and funding may affect the implementation of ecological sanitation technologies in rural areas of Zimbabwe.

1.7 Limitations

- Potential for selection bias: sample population may not be representative of the entire rural population in Zimbabwe.

- Participants may have different perceptions and attitudes towards ecosan technologies than those who do not participate. This was addressed by the use of a random sampling technique to select participants and ensure that the sample is representative of the target population.

- Social desirability bias: participants may have provided responses that they believe are socially acceptable, rather than their true perceptions and attitudes towards ecosan

technologies. To mitigate this, the study was conducted in a non-judgmental and nonthreatening manner to encourage participants to provide honest responses.

- The study faced logistical limitations, including limited resources and time constraints, which affected the sample size, the study focused on a specific ward to ensure comprehensive data collection.

1.8 Delimitations

- The study was limited to Ward 14 in Guruve district, Zimbabwe, and may not be generalizable to other rural areas in the country.

- The study focused on ecological sanitation (ecosan) technologies and does not include other sanitation technologies or practices.

- The study did not assess the technical feasibility or effectiveness of ecosan technologies in Ward 14, but rather focused on the perceptions and attitudes of rural communities towards these technologies.

CHAPTER 2: LITERATURE REVIEW

2. LITERATURE REVIEW

2.1 Introduction

The literature review outlined the introduction to ecological sanitation, sanitation challenges in rural Zimbabwe, adoption of ecosan in Zimbabwe and determinants of acceptability of ecosan in rural Zimbabwe

2.2 Introduction to ecological sanitation

Ecosan is a sustainable and cost-effective approach to sanitation that aims to recycle nutrients and organic matter from human waste to improve soil fertility and agricultural productivity (Banamwna et al., 2022). However, the adoption and operation of ecosan technologies vary greatly around the world, largely influenced by cultural beliefs and traditions. While some cultures view human excreta as a valuable resource, others consider it an unpleasant and dangerous waste product. The adoption of ecosan technologies in rural communities in Southern Africa has been seen as an economical solution for areas with vast space requirements, but there are widespread fears and concerns about handling human excreta, leading to resistance and stigmatization in some cultures (Munkhondia. 2013).

In many cultures, those who handle such waste are often viewed as outcasts (Chow and Gerson. 2022). People in places like Mozambique and Zimbabwe have expressed fear of being ridiculed for using excreta as fertilizer, as it is considered repulsive (Gwara. 2022). In Sweden, residents appreciate the water-saving benefits of composting toilets but worry about the social stigma. In extreme cases, some Kenyan cultures believe that evil spirits inhabit latrine pits, leading to resistance against household pit latrines (Zeldovich. 2021).

2.3 Sanitation challenges in rural Zimbabwe

Rural areas in Zimbabwe face significant challenges in terms of access to adequate sanitation. According to a 2022 report by UNICEF and the World Health Organization, 36% of the rural population in Zimbabwe lacked access to basic sanitation services, and 21% practiced open defecation (UNICEF and WHO, 2022). These poor sanitation conditions have been linked to various health and environmental problems, including waterborne diseases, soil degradation, and water pollution (Makonese et al., 2020).

2.4 Adoption of ecosan in Zimbabwe

In response to these health and environmental challenges, several pilot projects have been implemented to promote the adoption of Ecosan in rural Zimbabwe. For instance, the NGO Practical Action introduced the arborloo, a low-cost and simple Ecosan toilet, in the early

2000s (Morgan, 2007). Other organizations, such as UNICEF and the government of Zimbabwe, have also supported the construction of urine-diverting dry toilets (UDDTs) and other types of Ecosan facilities in rural communities (Chigonda et al., 2019).

Despite these efforts, the adoption of Ecosan in rural Zimbabwe has been relatively slow and uneven. A study by Chigonda et al. (2019) found that only 12% of households in their sample

had adopted Ecosan toilets, while the majority continued to use traditional pit latrines or practiced open defecation. This suggests that there may be significant barriers to the acceptability and uptake of Ecosan in these setting.

2.5 Determinants of acceptability of ecosan in rural Zimbabwe

Table 2.1 key characteristics and findings of literature on adoption of ecosan

Reference	Factor	Key characteristics and findings of the study
Makonese et al., (2020)	Socio-cultural factors	In many rural communities, the use of human waste as fertilizer is considered taboo, hindering the adoption of ecosan. Additionally, some ecosan toilet designs lack sufficient privacy and safety, particularly for women and girls.
Chigonda et al., (2019)	Awareness and knowledge	Limited awareness of the benefits of ecosan and the proper use and maintenance of ecosan facilities, affordability, and technical factors pose significant barriers to adoption in rural areas of Zimbabwe. Effective communication and education strategies are needed to promote understanding of the advantages of ecosan and address misconceptions about the handling of human waste.
Morgan, (2007)	Affordability	The cost of constructing and maintaining ecosan toilets may be prohibitive for some rural households, particularly those with limited financial resources. To address this barrier, various low-cost ecosan options, such as the arborloo, have been developed and promoted in Zimbabwe.

Chigonda et al., (2019)	Technical factors	Some rural households may face challenges in accessing the materials and technical expertise required to construct and maintain ecosan facilities. NGOs and government agencies have provided training and support to local artisans and builders to improve their capacity to construct ecosan toilets.

Reference	Factor	Key characteristics and findings of the study
Bhagwan et al., (2016)	Technical factors	The study found that the durability and maintenance of ecosan facilities were major concerns for rural communities in Zimbabwe and suggested that the use of locally available materials and simple designs could improve sustainability and ease of maintenance.
Makonese et al., (2021)	Awareness and knowledge	The authors found that community-led total sanitation (CLTS) interventions, combined with targeted communication and education strategies, can improve awareness and understanding of ecosan and increase adoption rates in rural Zimbabwe.

Mawere et al., (2018)	Technical factors	The study examined the use of urine-diversion toilets in rural Zimbabwe and found that the design and maintenance of these facilities could be improved to increase acceptability and sustainability.
Moyo et al., (2017)	Socio-cultural factors	The authors explored the cultural and religious beliefs that influence the acceptability of ecosan in rural Zimbabwe and suggested that community engagement and participation in the design and implementation of ecosan programs could improve adoption rates.
Reference	Factor	Key characteristics and findings of the study
Mudzimiri et al., (2016)	Technical factors	The study evaluated the performance of different ecosan toilet designs in rural Zimbabwe and found that the arborloo and VIP (ventilated improved pit) toilets had the highest acceptance and sustainability rates.
Nyamadzawo et al., (2017)	Technical factors	The authors investigated the use of composting toilets in rural Zimbabwe and found that the use of locally available materials, such as sawdust, could improve the safety and effectiveness of these facilities.

Siziba et al., (2018)	Awareness and knowledge	The study assessed the effectiveness of different communication strategies in promoting the adoption of ecosan in rural Zimbabwe and found that community-led approaches, such as drama performances and community meetings, were more effective than top-down approaches.

2.6 Summary

Four factors influencing the adoption of ecosan in rural Zimbabwe have received relatively some attention in the literature. However, there is a greater focus on technical factors and affordability, with several studies exploring the design and sustainability of ecosan facilities and the use of low-cost options. Socio-cultural factors, awareness, and knowledge are also important, with studies highlighting the need for community engagement and effective communication strategies. The study addressed the knowledge gap in understanding sociocultural factors and cost/benefit perceptions influencing ecosan adoption in rural Zimbabwe. Knowledge & awareness, institutional/policy factors, and sustainability/long-term use are gaps in knowledge that require further research in the adoption of ecosan technologies in rural Zimbabwe.

CHAPTER 3: METHODS AND MATERIALS

3. METHODS AND MATERIALS

3.1 Description of the study area

The study was conducted in Ward 14 (Latitude: -16.85877; Longitude: 30.81067) of Guruve district, Zimbabwe (Fig. 3.1). The ward has a population of 6 101 (male 3 210 and female 2

891) and 1 474 households in 7 villages (ZimStats, 2022). It has an annual temperature of 23.56 ºC and receives about 120.82 mm of precipitation. Sanitation coverage in the study area is 37% and open defecation is 21% (WHO/UNICEF, 2022).

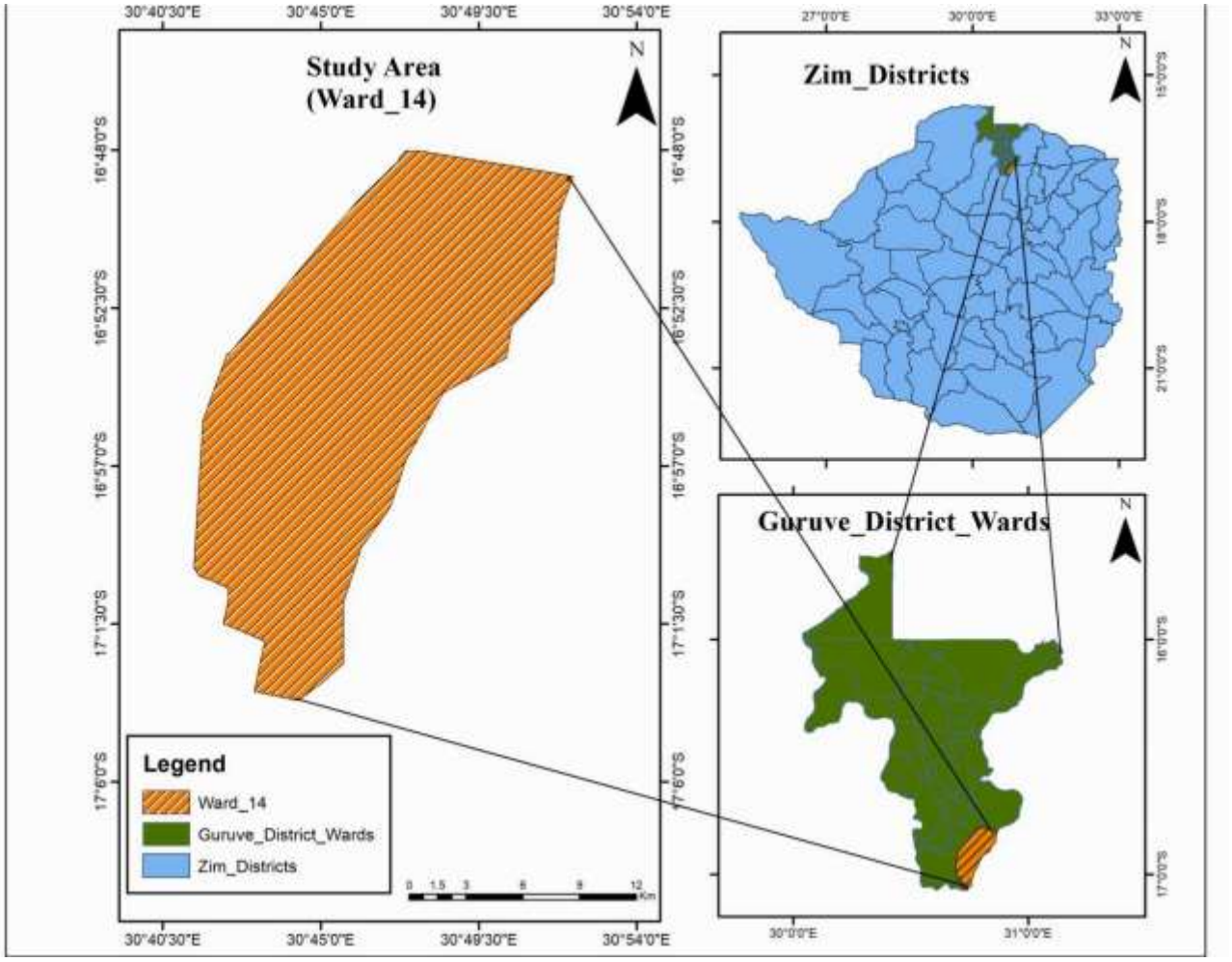

Figure 3.1 Study area (Ward 14 Guruve District, Zimbabwe)

3.2 Research design

A cross-sectional descriptive survey was used for the study. It allows the collection of data from many different individuals at a single point in time (Thomas, 2020). and is relatively cheap and less time-consuming (Kumar, 2018).

3.3 Determination of sample size and recruitment of participants

3.3.1 Sample size determination

Ward 14 has 1 474 households in seven rural villages (ZimStats, 2022). The sample size was determined using Slovin`s formula (1960) as described by Ellen (2020):

$n = N / (1 + N e^2)$ where n = No. of households

N = Population (1 474 households)

. e = Error tolerance (level) i.e. 0.05 n

$= 1\ 474 / 1 + (1\ 474 * (0.05)^2)$

= 315 households

Adjusted sample size (n_{adj}) for non-respondent (10%) was calculated using the equation:

Nadj = n/0.9

=315/0.9

= 350 households

3.3.2 Recruitment of participants

A stratified multistage random sampling technique (Formplus, 2022) was used to select the village. The study area was stratified into villages and then households (Table 3.1). A simple

random selection technique of picking papers from a hat was used to pick five villages out of the seven.

Table 3.1Recruitment of participants

Village	Total households	Sample ($x = (y/Z)*n_{adj}$)	Sampling intensity (%)(x/y)* 100
Birkdale	290	97	33.45
Kondo-kondo	280	93	33.21
Mutasa	75	25	33.33
Msitwe 1	305	102	33.44
Msitwe 2	100	33	33
Total	1050	350	33.33

3.4 Ethical considerations

The study was approved by Bindura University of Science Education through the Department of Environmental Science. Permission to carry out the study was granted in writing from the Rural District Council (Appendix 1), and verbally from the ward councillor and local traditional leaders (chief and village heads). The five principles of research ethics described by Saunders et al. (2009) were followed. These included gaining access, informed consent, anonymity, voluntary participation, and confidentiality. All participants were verbally informed of the purpose of the study and their rights as participants. The participant's identity was not to be included in the questionnaire. Participation was voluntary and all participants had the right to withdraw from the study at any time if they so wish. Information shared from the study was to be kept confidential and for educational purposes only.

3.5 Research instruments

3.5.1 Closed-ended questionnaire

Data were collected using a 35-item closed-ended questionnaire that comprised three sections

(Appendix 2). The questionnaire was designed to collect demographic information, perceptions, and the potential acceptability of ecological sanitation. The questionnaire was developed from several research studies related to ecological sanitation (Andersson, 2014; and WHO, 2020).

3.6 Validity and reliability

The supervisor first assessed the questionnaire before administration. Common errors like double-barrelled, confusing, and leading questions were removed (Betts et al. 2022). Steps according to Collingridge (2023) were taken to validate the different measures in the questionnaire by systematically going through the literature (Legislation, earlier research, theory, and earlier questionnaires), conducting a pilot test on a subset of five volunteered participants, and by receiving feedback and advice on the questionnaire administered in Ward 14, Guruve.

3.7 Data collection

Printed questionnaires were distributed to the participants, with the help of two VHWs. Clear and concise instructions were provided to the participants, including the purpose of the study, how to answer the questions and the deadline for completing the survey. The completed questionnaires were collected and checked for mistakes and errors before leaving the village.

3.8 Data management

Logistic regression analysis was employed to determine determinants of ecosan acceptance as data were categorical (Kamberaj and Valton, 2021). The dependent variable was question 14 from the questionnaire (do you prefer an ecosan latrine) with three categories (Yes, No, and Not sure) requiring multinomial logistic regression (MLR). The response (predictor) variables were

demographic data and responses from the questionnaire. Determinants and predictors were categorised based on the IBM-WASH framework (Kanda et al., 2021).

CHAPTER 4: RESULTS

4. RESULTS

4.1 Demographic characteristics of survey respondents

Table 4.1 shows the demographic characteristics of the respondents. Results indicate that respondents were mainly female (54.8%). Approximately 60% of them fell between 26 and 45 years of age. Ethnicity was dominated by the Kore-kore ethnolinguistic group (50%). Respondents (23%) depended on the sale of agricultural produce to generate a household monthly income of approximately 51-100 USD in most households (36%). Three variables (religion, residence period, and nature of household) were significantly associated with the preference for ecological sanitation ($p < 0.05$). Household- and individual-level predictor variables for ecosan preference were outstanding, each having two or more factors (Table 4.2).

Table 4.1: Demographic characteristics of respondents and households, Ward 14, Guruve District, Zimbabwe, 2023, showing association with a preference for ecological sanitation (n = 292).

Variable Categories		number	%	Pearson χ^2 χ^{2-} Test Value	Test P Value
Village	Msitwe 1	102	34.9	19.457	**0.01**
	Birkdale	97	33.2		
	Kondo-kondo	93	31.8		
Gender	Male	132	45.2	0.582	0.748
	Female	160	54.8		
Age group (years)	18-25	62	21.2	6.793	0.559
	26-35	98	33.6		
	36-45	91	31.2		
	46-55	26	8.9		
	>55	15	5.1		
Marital status	Married	118	40.4	8.205	0.225
	Widowed	60	20.5		
	Divorced	66	22.6		
	never married	48	16.4		
Religion	Christian	161	55.1	16.044	**0.014**
	Traditional	90	30.8		
	Moslem	40	13.7		
	Other	1	0.3		

Residence period (years)	<2	23	7.9	14.186	**0.028**
	2-10	126	43.2		
	11-20	77	26.4		
	>20	66	22.6		
Household size	<2	59	20.2	1.948	0.924
	3-4	102	34.9		
	5-6	84	28.8		
	>6	47	16.1		
Nature of household	Nucleus	234	80.1	9.600	**0.008**
	Extended	58	19.9		
Ethnicity	Kore-kore	146	50.0	11.381	0.077
	Zezuru	86	29.5		
	Karanga	58	19.9		
	Other	2	0.7		
Formal educational level	none	57	19.5	11.834	0.066
	Primary	93	31.8		
	secondary	131	44.9		
	Tertiary	11	3.8		
Household income (US$)	<50	88	30.1	13.330	0.101
	51-100	105	36.0		
	101-150	61	20.9		
	151-200	24	8.2		
	>200	14	4.8		
	formally employed household member	57	19.5		

	self-employed	11.678		0.166
	household member	75	25.7	
Source of income	small-scale business enterprise	45	15.4	
	sale of agricultural produce	67	22.9	
	hired labour	48	16.4	

Figures in **bold** denote significant association ($p < 0.05$).

Table 4.2 Predictor variables used in the model for latrine adoption using the IBM-WASH framework (Kanda et al., 2021.).

Level	Contextual Factors	Psychosocial Factors	Technology and economic Factors
Structural / Environmental	• Pollution of nearby water sources • Can be built on the most difficult environment		
Community			
Household	• Household size • Source of income • Level of income • Family setup • Residency period		
Individual	• Sex • marital status • age group • Educational level • Ethnicity Religion Knowledge of ecological sanitation	• Beliefs associated with contacting the human waste • Dignity • Security	• Availability of construction material Material cost Operation and •

	• Gender specific	maintenance
Habitual	• Emptying of urine and excreta containers	

4.2 Perceptions of participants on household sanitation

4.2.1 Sanitation facility at the household

Fig. 4.1 shows type of latrine at household in all the three villages. The results indicate that 79.7% of the households had poor sanitation facilities. The traditional pit latrine was the most common and used in all villages while the ecosan were the least common in all villages.

Birkdale village had all six types of sanitation facilities.

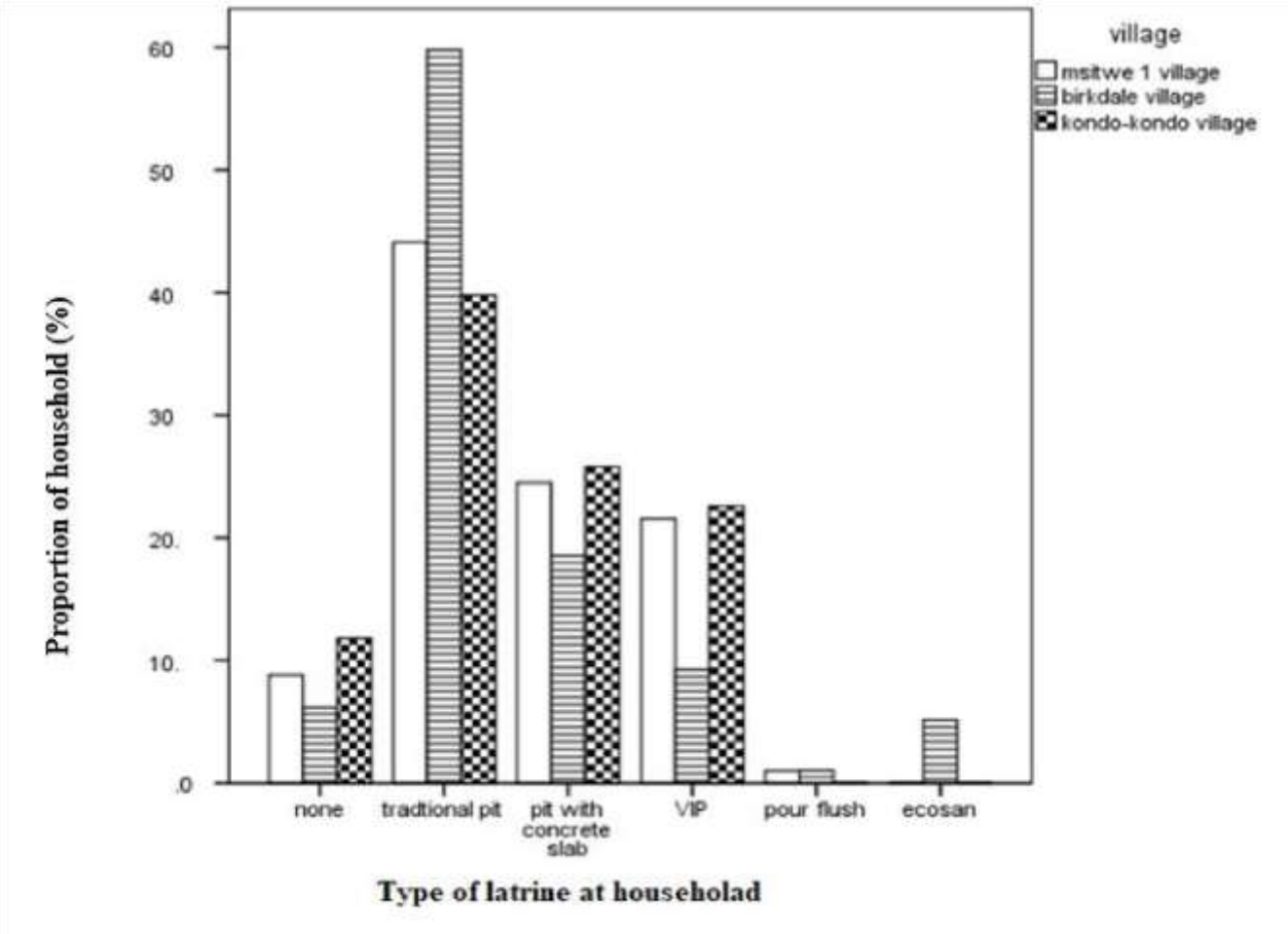

Fig. 4.1 Type of latrine at a household

4.2.2 Preference of an ecosan latrine

Fig. 4.2 shows proportion of households preferring an ecosan latrine in all the three villages. The results indicate that a large proportion of households in Msitwe village preferred ecological sanitation more than households in Birkdale and Kondo-kondo village. The proportion of households who were not sure if they would prefer ecosan option (>50%) was higher than those who preferred the ecosan option (<30%) and those who would not prefer the ecosan option <40%).

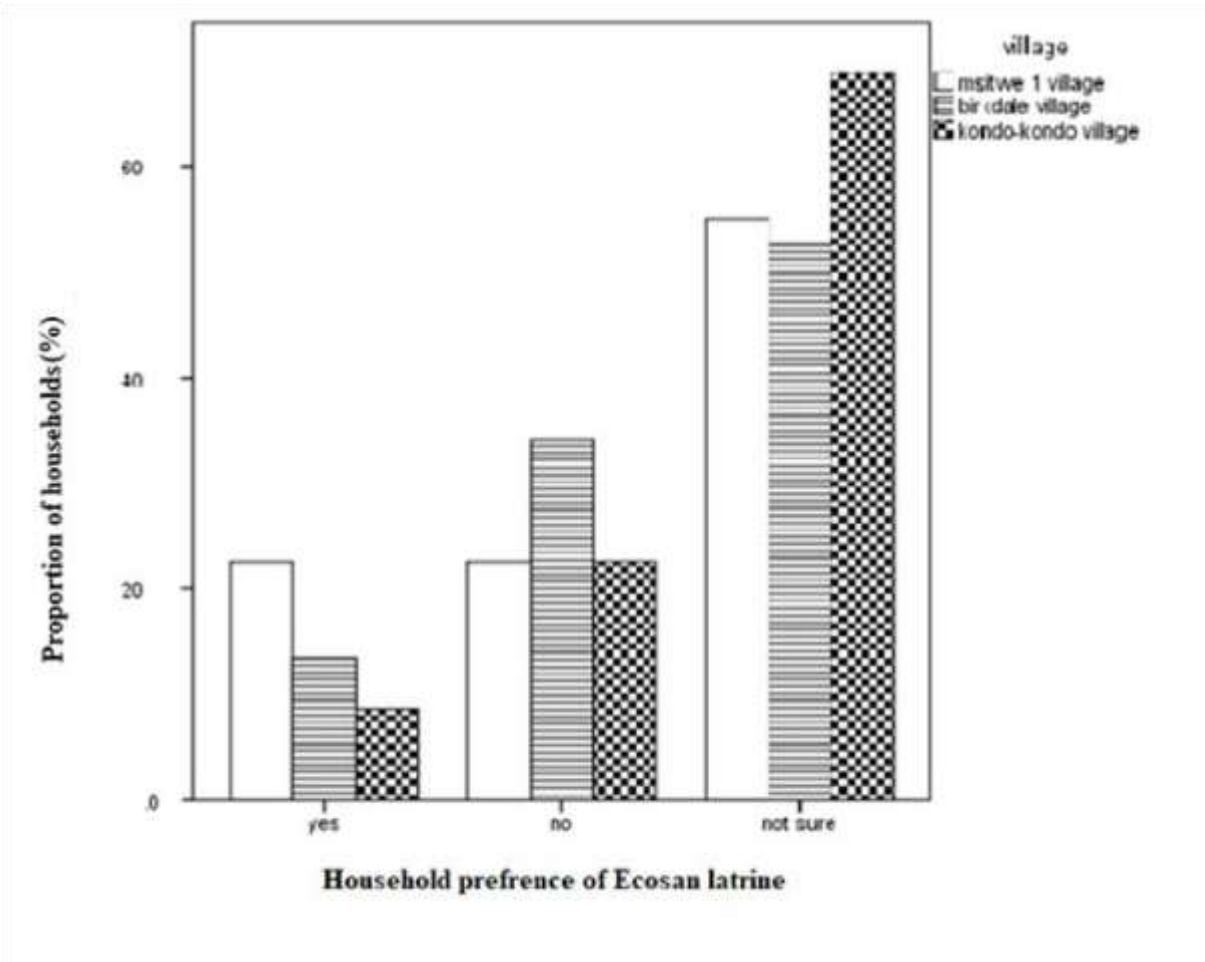

Fig. 4.2 Proportion of households preferring an ecosan latrine

Fig. 4.3 shows reasons why households in ward 14 preferred an ecosan latrine. The results show that a large proportion of households in ward 14 (>25%) preferred the ecosan latrine because they considered it to be easy to construct with local materials and affordable in rural areas. A few (<10%) considered it easy to operate and maintain and hygienic latrine to use.

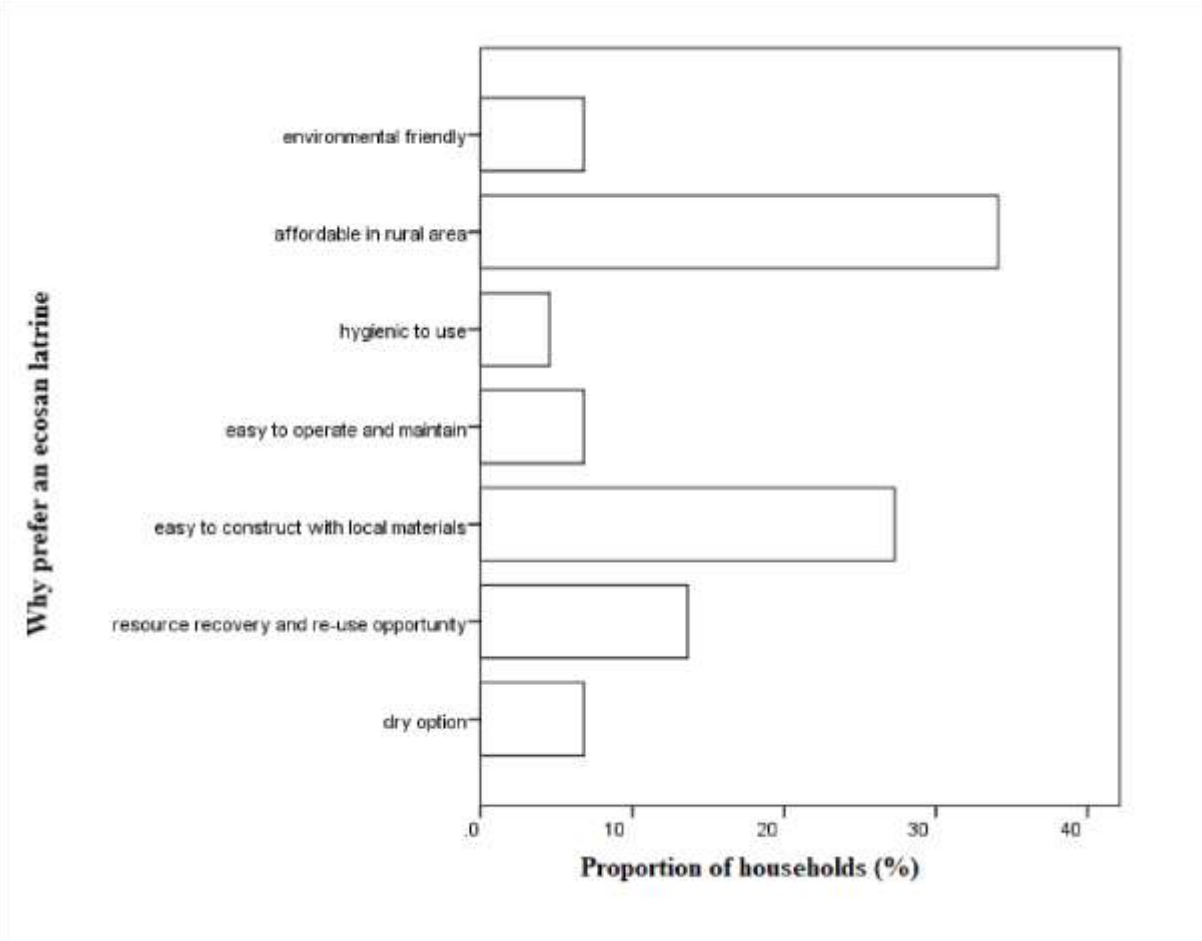

Fig. 4.3 Reasons for preferring the ecosan latrine

4.2.3 Reasons for not preferring an ecosan latrine

Fig. 4.4 shows reasons why households did not prefer an ecosan latrine. The results indicate that households in birkdale village found the ecosan latrine difficult to operate and maintain (>30%), which made it inconvenient for them to use. The households in Kondo-kondo village considered handling and sighting human excreta as culturally unacceptable (>30%), which made it difficult for them to use the ecosan latrine.The households in Ward 14 had no knowledge of the ecosan latrine type (>10%), and therefore, were not aware of its benefits and how to use it properly. A small proportion of the households in ward 14 (<5%) opted for not using treated human watse for agricultural purposes because they considered it unhealthy.

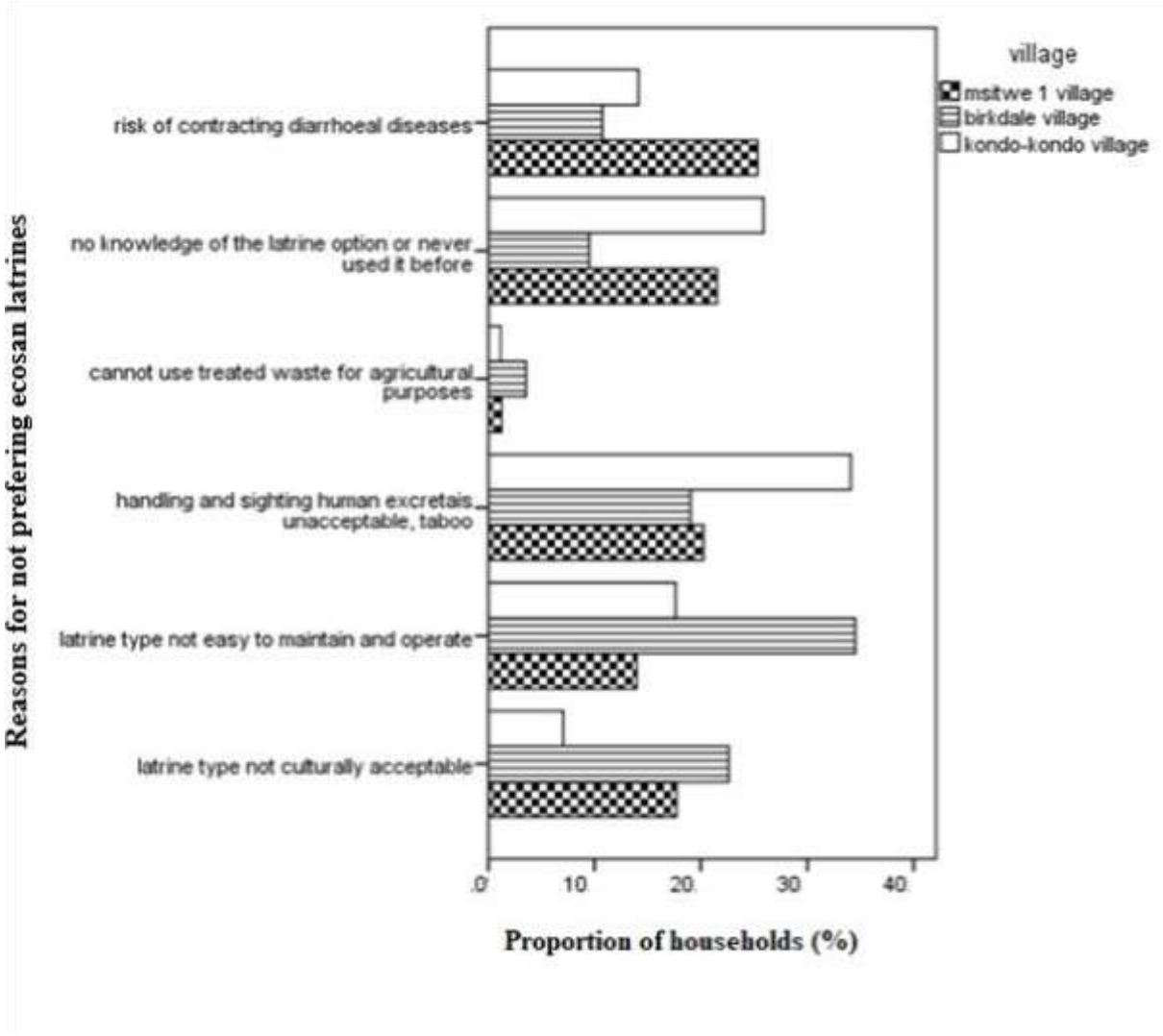

Fig 4.4 Reasons for not preferring an ecosan latrine

4.3 Handling of human waste

Fig. 4.5 shows beliefs associated with handling human waste and urine. Results suggest that all the three villages (Birkdale, Kondo-kondo and Msitwe) considered handling of human waste to be associated with bad luck, while a large proportion of households in Birkdale village (>30%) considered it to be a taboo. A small proportion of households from all three villages suggested that there was no association or belief associated with handling and sighting human excreta and urine.

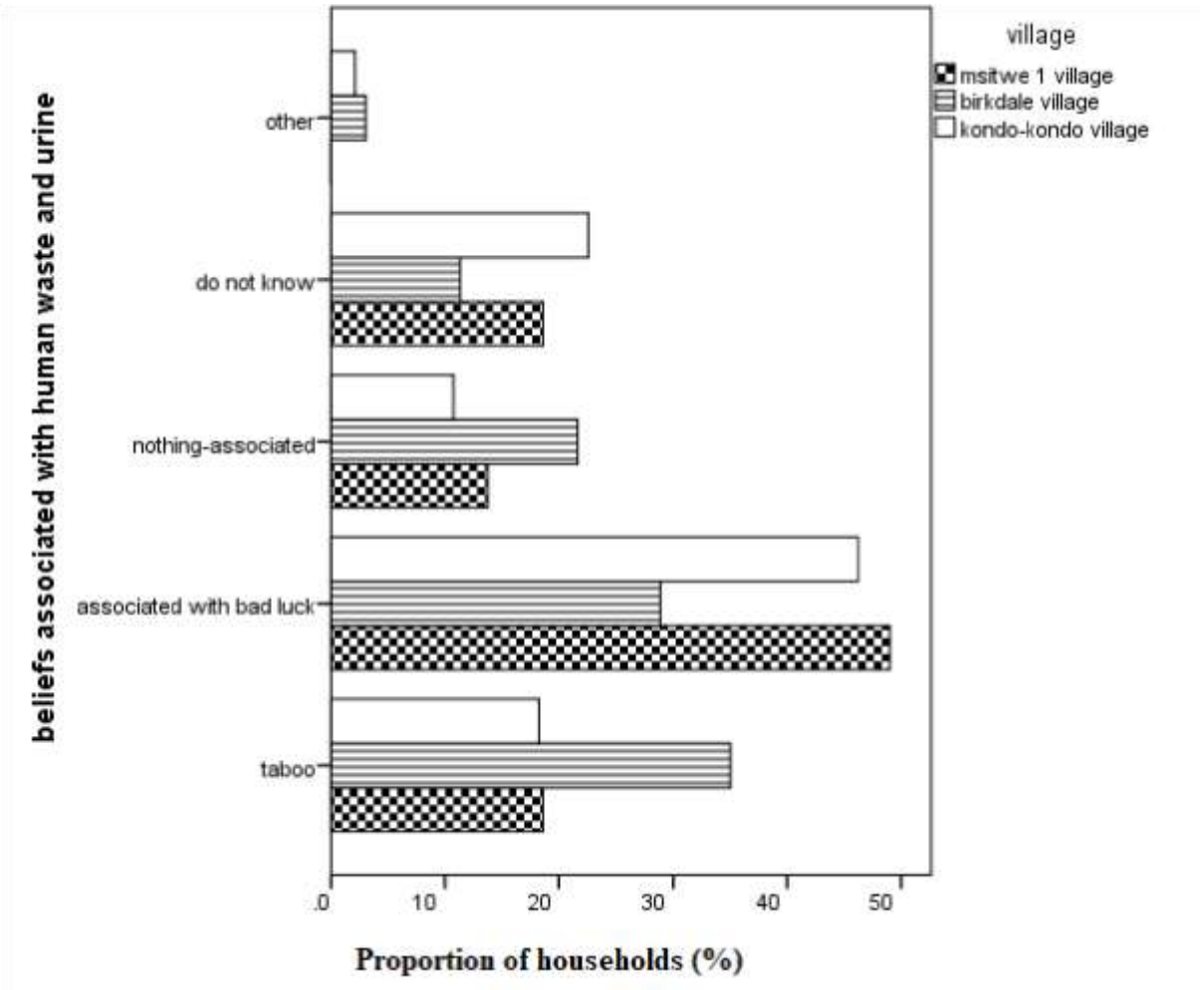

Fig. 4.5 Beliefs associated with handling human waste and urine

4.4 Determinants of preference for ecological sanitation in Ward 14, Guruve

Table 4.3 shows significance determinants of preference for ecological sanitation in ward 4 Guruve.

Model Fitting Information

Model	Model Fitting Criteria	Likelihood Ratio Tests		
	-2 Log Likelihood	Chi-Square	df	Sig.
Intercept Only	554.821			
Final	304.784	250.036	118	.000

The p-value of <0.001 shows that the model predicts the outcome variable (preference for ecosan latrine) significantly well.

Pseudo R-Square

Cox and Snell	0.420
Nagelkerke	0.474
McFadden	0.451

The Pseudo R-square values are moderate, indicating the model explains 42-47% of the variability. This shows the model has moderately good explanatory power. **Classification**

Observed	Predicted			
	Yes	no	not sure	Percent Correct
Yes		4	8	66.3%
No	32	42	32	64.9%
not sure	37	14	150	87.7%
Overall Percentage	14.4%	20.5%	65.1%	65.6%

The classification table shows that the model correctly classified 66.3% of respondents who preferred ecosan latrines and 64.9% of those who did not prefer ecosan latrines. The overall correct classification was 65.6%. This shows moderately good predictive ability of the model. The analysis shows that the logistic regression model is significantly reliable in predicting preferences for ecosan latrines, with moderate explanatory and predictive power.

Table 4.3 Significance determinants of preference for ecological sanitation in ward 4 Guruve. ((n = 292), full multinomial logistic regression output appendix 4)

Parameter Estimates

14. do you prefer an ecosan latrine		B	Std. Error	Wald	df	Sig.	Exp(B)	95% Confidence Interval for Exp(B)	
								Lower Bound	Upper Bound
yes	Intercept	4.521	3434.631	0.000	1	0.999			
	11. source of income = 1	-.280	1.162	0.058	1	0.810	0.756	0.077	7.374
	11. source of income = 2	-2.346	1.088	4.646	1	**0.031**	0.096	0.011	0.808
	11. source of income = 3	-.494	1.010	0.240	1	0.624	0.610	0.084	4.413
	11. source of income = 4	-.485	0.947	0.262	1	0.609	0.616	0.096	3.939
	11. source of income = 5	0[b]	.	.	0	.	.	.	.
	19. material cost = 1	-1.518	1.229	1.525	1	0.217	0.219	0.020	2.439
	19. material cost = 2	-2.915	1.277	5.210	1	**0.022**	0.054	0.004	0.662
	19. material cost = 3	-4.362	1.886	5.348	1	**0.021**	0.013	0.000	0.514
	19. material cost = 4	-2.911	1.847	2.483	1	0.115	0.054	0.001	2.033
	19. material cost = 5	0[b]	.	.	0	.	.	.	.
	25. security = 1	1.709	1.062	2.591	1	0.107	5.524	0.689	44.259
	25. security = 2	-3.483	1.165	8.940	1	**0.003**	0.031	0.003	0.301
	25. security = 3	0[b]	.	.	0	.	.	.	.
no	Intercept	-2.590	1485.629	0.000	1	0.999			
	3. marital status = 1	1.599	0.729	4.818	1	**0.028**	4.950	1.187	20.646
	3. marital status = 2	1.431	0.846	2.862	1	0.091	4.182	0.797	21.942

	3. marital status = 3	1.351	0.858	2.478	1	0.115	3.861	.718	20.753
	3. marital status = 4	0[b]	.	.	0	.	.	.	.
	5. residence period = 1	2.676	0.944	8.044	1	**0.005**	14.529	2.286	92.351
	5. residence period = 2	1.533	0.700	4.797	1	**0.029**	4.633	1.175	18.270
	5. residence period = 3	1.293	0.686	3.557	1	0.059	3.643	0.951	13.964
	5. residence period = 4	0[b]	.	.	0	.	.	.	.
	7. nature of household = 1	-1.663	0.650	6.555	1	**0.010**	0.190	0.053	0.677
	7. nature of household = 2	0[b]	.	.	0	.	.	.	.
	13. do you know ecological sanitation = 1	-1.648	0.548	9.046	1	**0.003**	0.192	0.066	0.563
	13. do you know an ecological sanitation = 2	0[b]	.	.	0	.	.	.	.
	19. material cost = 1	.406	0.931	0.190	1	0.663	1.501	0.242	9.315
	19. material cost = 2	.735	0.914	0.647	1	0.421	2.086	0.348	12.513
	19. material cost = 3	1.161	1.168	0.988	1	0.320	3.193	0.324	31.487
	19. material cost = 4	2.058	1.028	4.013	1	**0.045**	7.833	1.046	58.689
	19. material cost = 5	0[b]	.	.	0	.	.	.	.
	22. built in most difficult environments = 1	2.033	0.694	8.583	1	**0.003**	7.638	1.960	29.765
	22. built in most difficult environments = 2	1.057	0.482	4.804	1	**0.028**	2.879	1.118	7.411
	22. built in most difficult environments = 3	0[b]	.	.	0	.	.	.	.

Figures in **bold** denote significant association ($p < 0.05$).

The results show that significant determinants of preference for ecological sanitation were three individual, one household, one economical, one environmental, one psychosocial, and two technology-based variables based on the IBM-WASH framework. A participant with

knowledge of ecological sanitation was significantly more likely to prefer the sanitation option than one who did not know it (OR = 0.192, p = 0.003, add 95% CI = 0.066 to 0.563). There was a significantly increased likelihood of preferring ecological sanitation by one who perceived its construction material to be cheap than one who did not (OR= 7.833, p = 0.045 and 95% CI = 1.046 to 58.689). There was significant more likelihood of preference for ecological sanitation by married households (OR = 4.950, p = 0.028 and 95% = 1.187 to 20.646). Available evidence shows that households practicing agriculture were more likely to prefer the ecological sanitation option more than household earning a living from a formal employment (OR = 0.096, p = 0.031 and 95%CI = 0.011 to 0.808)

A person who lived in Ward 14, Guruve for more than ten years (OR = 14.529, p = 0.005 and 95%CI = 2.286 to 92.351) within a nucleus household setup (OR = 6.555, p = 0.010 and 95%CI = 0.677 to 20.053), was more likely to prefer an ecological sanitation than a person lived less than ten years and in an extended household setup. There was greater significant likelihood of security influencing the preference of ecological sanitation (OR = 0.031, p = 0.003 and 95%CI = 0.003 to 0.301). It is evident that, participants were more likely to prefer ecological sanitation option because it can be built on most difficult environments (rocky grounds, high water table areas and poor soil) (OR = 7.638, p = 0.003 and 95%CI = 1.960 to 29.765).

CHAPTER 5: DISCUSSION

5. DISCUSSION

5.1 Introduction

This chapter discusses the major findings of the study on the acceptability of ecological sanitation (ecosan) in Ward 14, Guruve district, Zimbabwe. The discussion focused on the characteristics of study participants, types of latrines used by households, reported preference for ecosan latrines and determinants of ecosan latrine preference. The study limitations and a summary of key issues were also highlighted.

5.2 Characteristics of participants

The demographic variables (ethnicity, religion, residence period, marital status, level of education, and age) have been shown to influence the adoption and sustainability of sanitation interventions, these variables were similar to those considered in most previous studies on the adoption and sustainability of sanitation interventions (Ampofo et al., 2017; Joshi et al., 2019; Mekonnen and Mekonnen, 2003). However, nature of household (OR = 6.555, p = 0.010 and 95%CI = 0.677 to 20.053) may not have been considered in most similar studies. The nature of the household (nucleus) is not always significant and included in most sanitation interventions adoption studies because the focus is often on the broader social, cultural, and economic factors that influence the adoption of sanitation interventions, rather than on individual household characteristics. (Alemu et al., 2017, and Nguyen et al.,2017).

5.3 Types of latrines at households

In rural communities of Zimbabwe and other low- and middle-income countries, pit latrines are the most common type of latrine used due to their low cost and simple design (Chirisa and Eales, 2015; UNICEF/WHO, 2021). The high prevalence of pit latrines in the study area may

be attributed to their ease of construction and maintenance, as well as their suitability for areas with limited water supply. However, as highlighted in the study, the absence of latrines (>15%) or the practice of open defecation is a significant public health concern, which needs to be addressed through the provision of safe and sustainable sanitation facilities in rural areas. This is particularly important given the potential health impacts associated with open defecation, including the contamination of water sources and the spread of waterborne diseases such as cholera, typhoid, and diarrhoea (Bain et al., 2014; WHO, 2021).

A study conducted in Nepal by Joshi et al. (2019) found that type of latrine varied with villages due to differences in access to resources, cultural preferences, or other factors that influence the adoption of different types of latrines (Biran et al., 2012; Chirisa and Eales, 2015, 2019;

Mekonnen and Mekonnen, 2003)

5.4 Reported preference to an ecosan latrine

The study reported a low preference for ecosan latrines, households found the latrine option difficult to operate and maintain, handling and sighting human excreta as culturally unacceptable and many had no knowledge of ecosan latrine. A study conducted in Nepal by Joshi et al. (2019) reported a low preference for ecosan latrines (15.1%), with low- and middleincome rural communities being more likely to be dominated by VIPs and traditional pit latrines (Biran et al., 2012; Chirisa and Eales, 2015; Mekonnen and Mekonnen, 2003). The dominance of VIPs and traditional pit latrines in ward 14 Guruve, Napal and other low- and middle-income rural communities is directly related to factors such as the cost of constructing and maintaining toilets, and cultural beliefs and practices related to sanitation and hygiene.

5.5 Determinants of preference of an ecosan latrine

The study found that various factors were significant determinants of the preference for ecosan latrines, including nature of household, source of income, cost of construction materials, security, marital status, length of stay in the area, knowledge about ecosan, and whether the latrine was built in a difficult environment. These determinants can be categorized based on the IBM-WASH (Dreibelbis et al., 2013) framework, with individual-level factors such as knowledge and marital status, and household-level factors such as the length of stay in the area and the cost of construction materials.

Material cost: This variable was found to be significant in both this study and the study by Bhalla et al. (2016). The cost of construction materials can be a significant barrier to the adoption of sanitation technologies, particularly for households with limited financial resources.

Security: This variable was found to be significant in both this study and the study by Joshi et al. (2019). Insecurity or fear of violence may be a barrier to the adoption of sanitation technologies, particularly in areas with high levels of crime or conflict.

Residence period: This variable was found to be significant in both this study and the study by Joshi et al. (2019). Length of residence in an area may be related to familiarity with local environmental issues or to a sense of community belonging, both of which may influence the adoption of sanitation technologies.

Source of income: This variable was found to be significant in this study and the study by Morgan, (2007). Households with a more reliable or higher source of income may be more willing or able to invest in more sustainable sanitation solutions, such as ecosan or VIP latrines.

Marital status: This variable was found to be significant in this study and the study by Makonese et al., (2020). Marital status may be related to household decision-making and resource allocation, which may influence the adoption of sanitation technologies.

Knowledge about ecological sanitation: This variable was found to be significant in this study and the study by Siziba et al., (2018). Knowledge and awareness about the benefits of ecological sanitation may be an important factor in the adoption of these technologies.

Whether the latrine was built in a difficult environment: This variable was found to be significant in this study and the studies by Bhagwan et al., (2016), and Chigonda et al., (2019). Durability of the latrine may be an important factor in the adoption of these technologies.

Nature of household: This variable was found to be significant in this study but not significant in the studies by Alemu et al., (2017), and Nguyen et al., (2017). The importance of household characteristics may vary depending on the specific context and population being studied, there is evidence to suggest that household income, education level, and other demographic factors can play an important role in the adoption of sanitation interventions.

5.6 Study limitations

Limitations that could affect the generalisability of the results to other contexts include:

- Small sample size: the study surveyed only 292 households, which may not be representative of the entire population of the study area. The small sample size could limit the generalisability of the results to other rural communities in Zimbabwe or other low- and middle-income countries.

- Limited geographic scope: the study was conducted in only one ward in Guruve district, which may not be representative of other wards or districts in Zimbabwe. The findings may not be applicable to other rural communities in Zimbabwe or other low- and middle-income countries.

- Potential for response bias: the study relied on self-reported data which may be subject to response bias. Respondents may have provided socially desirable answers or may not have accurately reported their attitudes and behaviours.

- Limited scope of data collection: the study focused only on the acceptability of ecological sanitation and did not collect data on other factors that may affect the adoption and sustainability of sanitation interventions, such as institutional factors or access to resources.

To overcome some of the limitations, the study used pre-tested and reliable questionnaire to ensure consistency in data collection

CHAPTER 6: CONCLUSION AND RECOMMENDATIONS

6. CONCLUSION AND RECOMMENDATIONS

6.1 Conclusion

The study found that nature of household, source of income, cost of construction materials, security, marital status, length of stay in the area, knowledge about ecosan, and whether the latrine was built in a difficult environment were significant determinants of the preference for ecosan latrines. Pit latrines were prevalent in the area, but proper design, construction, and maintenance are necessary for their safety and sustainability. The findings have important implications for sanitation policy and practice in low- and middle-income countries, emphasising the need for culturally appropriate, cost-effective, and easy-to-maintain interventions that involve community participation. The study suggests that further research is needed to explore the interaction between different determinants of ecosan latrine adoption and to examine the effectiveness of community-based approaches in promoting the adoption and sustainability of these latrines in low- and middle-income countries.

6.2 Recommendations

Based on the findings of the study, the following recommendations were made:

- Sanitation interventions should be tailored to the specific needs and preferences of different communities, taking into account factors such as knowledge of ecological sanitation, village, religion, residence period, nature of household, material cost, cost of maintenance, and security.

- The need for community education and awareness programs to promote the adoption of ecological sanitation in rural communities.

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APPENDICIES

APPENDIX 1: PERMISSION LETTER

BINDURA UNIVERSITY OF SCIENCE EDUCATION
DEPARTMENT OF ENVIRONMENTAL SCIENCE

Bag 1020 BINDURA, Zimbabwe
Tel: 263 - 71 – 6505
Cell:0778371588
Email: vamugure@gmail.com

06 March 2023

Dear Sir/Madam

REQUEST FOR PERMISSION TO COLLECT DATA FOR AN ACADEMIC RESEARCH PROJECT FROM WARD 14 GURUVE DISTRICT

PROJECT TITLE: ***ACCEPTABILITY OF ECOLOGICAL SANITATION IN WARD 14 GURUVE DISTRICT, ZIMBABWE.***

ACADEMIC SUPERVISOR: DR A KANDA

This letter serves to inform you that **SAMUEL MAGOMO, Registration Number (B191403B)** is a fourth-year student at the Bindura University of Science Education, in the Department of Environmental Science. During his fourth year of study, he is supposed to do a research project in his area of specialisation.

Please assist in any possible way. Data collected will be used for academic purposes only and will not be published without your prior consent.

Thank you for your assistance.

Yours faithfully.

Mr. T. Nyamugure
DEPARTMENT OF ENVIRONMENTAL SCIENCE

APPENDIX 2: RESEARCH QUESTIONNAIRE

Questionnaire No.

BINDURA UNIVERSITY OF SCIENCE EDUCATION

DEPARTMENT OF ENVIRONMENTAL SCIENCE

RESEARCH QUESTIONNAIRE

Acceptability of ecological sanitation options among rural communities of Ward 14, Guruve district, Zimbabwe

Village: ……..…… Date: ……..

Introduction

My name is **SAMUEL MAGOMO.** I am a 4th year undergraduate student from the Department of Environmental Science at Bindura University of Science Education. I am carrying out a research project entitled: *Acceptability of ecological sanitation options among rural communities of Ward 14, Guruve district, Zimbabwe.*

The purpose of the study is to find out perceptions on and potential acceptability of ecological sanitation (toilet that recycles their excrement for reuse) by rural communities at household level. The findings may be useful to inform sanitation planning in view of the proposed new sanitation and hygiene policy under review to consider alternative sanitation options. You have been randomly selected to voluntarily participate in the study.

Your participation is simply by responding to the questionnaire. I promise to maintain confidentiality and anonymity for the information shared. You are free to end your participation if you feel you can no longer continue at any time of the interview. Information shared will only be used for academic purposes without tracing it back to you. No names shall be used. I shall assist in filling out the questionnaire. Your cooperation is greatly appreciated.

By agreeing to participate in the study I will assume you have understood it and thus given your informed consent. The questionnaire will take about 15 minutes to answer.

Instructions

Indicate the number corresponding to your response by ticking it.

SECTION A: DEMOGRAPHIC DATA

1. Gender **1**. Male **2**. Female
2. Age group (years) **1**. 18 - 25 **2**. 26 - 35 **3**. 36 - 45 **4**. 46 - 55 **5**. > 55
3. Marital status **1**. Married **2**. Widowed **3**. Divorced **4**. Never married

4. Religion **1**. Christian **2**. Traditional **3**. Moslem **4**. Other

If other, please specify ……

5. Residence period in your village (years) **1**. < 2 **2**. 2 -10 **3**. 11 - 20 **4**. > 20
6. Household size (members) **1**. ≤ 2 **2**. 3 - 4 **3**. 5 -6 **4**. > 6
7. Nature of household **1**. Nucleus **2**. Extended
8. Ethnic group **1**. Kore-kore **2**. Karanga 3. Zezuru 4. Other

If other, please specify ……

9. Highest educational level attained **1.** None formal **2**. Primary **3**. Secondary **4**. Tertiary
10. Approximate monthly household income (USD)

1. < 50 **2**. 51 - 100 **3**. 101- 150 **4**. 151 – 200 **5**. > 200

11. Main source of household income

1. Formally employed household member
2. Self-employed household member
3. Small-scale business enterprise
4. Sale of agricultural produce
5. Hired labour **6**. Other

If other, please specify ……

SECTION B: PERCEPTIONS OF ECOSAN OPTION

12. Type of latrine at household **1**. None **2**. Traditional pit **3**. Pit with concrete slab **4**. Ventilated improved pit **5**. Pour flush **6**. Ecological sanitation **7**. Other

If other, please specify ……

13. Do you know or ever heard of any ecological sanitation latrine? **1**. Yes **2**. No
14. Do you think you may prefer an ecological sanitation latrine at your household? **1**. Yes **2**. No **3**. Not
15. If your answer to 14 above is not YES, what could be the reasons for you not to prefer having an ecological latrine at your household?

1. Latrine type is not culturally acceptable
2. Latrine type is not easy to maintain and operate
3. Handling and sighting human excreta is unacceptable, social taboo
4. Cannot use treated waste for agricultural purposes

5. No knowledge of the latrine option or never used it before
6. Risk of contracting diarrhoeal diseases
7. Other

If other, please specify ……

16. If your answer to 14 above is YES, suggest why you would **most likely** you use a toilet that stores and collects urine and faeces?

1. Not water-dependent (dry option)
2. Resource recovery and re-use opportunity
3. Easy to construct with local materials
4. Easy to operate and maintain
5. Durable
6. Hygienic to use
7. Affordable in rural area
8. Environmental friendly
9. Other

If other, please specify ……

17. Beliefs associated with contacting human waste and urine. 1. Taboo 2. Associated with bad luck 3. Nothing-associated 4. Do not know 5. Other

If other, please specify ……

18. Presence of material to construct the latrine. 1. Readily available 2. Purchased and transported 5. Not sure

19. Cost of material and construction of the latrine. 1. Very cheap 2. Cheap 3. Expensive 4. Very expensive 5. Not sure

20. Does the latrine provides other benefits for example provision of manure and/or biogas?

1. Yes 2. No 3. Not sure

21. Potentially pollute nearby water sources 1. Yes 2. No 3. Not sure

22. Can be built in most difficult environments e.g. rocky ground, high water table ground, poor soil. 1. Yes 2. No 3. Not sure

23. Cost of maintaining the latrine. 1. Cheap to maintain 2. Expensive to maintain

24. Do you think an ecological sanitation latrine provides dignity? 1. Yes 2. No 3. Not sure

26. Do you think an ecological sanitation latrine provides security? 1. Yes 2. No 3.

Not sure

26. Do you think an ecological sanitation latrine must be gender specific 1. Yes 2. No 3. Not sure

SECTION C: ACCEPTABILITY OF ECOSAN OPTIONS highlight numbers for responses

27. Would you use sanitized human faeces and urine as fertilizer? 1. Yes 2. No 3. Not sure

28. Will you adopt and use an ecosan latrine even without knowledge but given guidelines by responsible authorities 1. Yes 2. No 3. Not sure

29. Will you adopt and use an ecosan latrine considering you have adequate knowledge, and training and given guidelines by responsible authorities 1. Yes 2. No 3. Not sure

30. Will you pay for the construction of an ecosan latrine 1. Yes 2. No 3. Not sure

31. Will you empty urine/excreta containers of ecosan latrine regularly 1. Yes 2. No 3. Not sure

32. Will you use an ecosan latrine if you are not the one emptying urine/excreta containers
1. Yes 2. No 3. Not sure

33. Will you use sanitised urine / treated excreta as manure or fertilizer 1. Yes 2. No 3. Not sure

34. Will you consume crops grown from manure derived from human waste 1. Yes 2. No
3. Not sure

END OF QUESTIONNAIRE … THANK YOU FOR YOUR PARTICIPATION

APPENDIX 3: MULTINOMIAL LOGISTIC REGRESSION OUTPUT

Pseudo R-Square

Cox and Snell	0.575
Nagelkerke	0.676
McFadden	0.451

Classification

Observed	Predicted			
	Yes	no	not sure	Percent Correct
yes	32	4	8	72.7%
no	3	42	32	54.5%
not sure	7	14	150	87.7%
Overall Percentage	14.4%	20.5%	65.1%	76.7%

Model Fitting Information

Model	Model Fitting Criteria	Likelihood Ratio Tests		
	-2 Log Likelihood	Chi-Square	df	Sig.
Intercept Only	554.821			
Final	304.784	250.036	118	.000

14. do you prefer an ecosan latrine[a]		B	Std. Error	Wald	df	Sig.	Exp(B)	95% Confidence Interval for Exp(B)	
								Lower Bound	Upper Bound
Parameter Estimates									
	Intercept	4.521	3434.631	.000	1	.999			
	[1.gender=1]	.130	.633	.042	1	.838	1.138	.330	3.933
	[1.gender=2]	0[b]	.	.	0	.	.	.	.
	[2.age=1]	-.079	1.701	.002	1	.963	.924	.033	25.941
	[2.age=2]	-.126	1.434	.008	1	.930	.881	.053	14.634
	[2.age=3]	.488	1.334	.134	1	.714	1.630	.119	22.270
	[2.age=4]	-.550	1.437	.147	1	.702	.577	.035	9.640
	[2.age=5]	0[b]	.	.	0	.	.	.	.
	[3.maitalstatus=1]	.444	.993	.200	1	.655	1.559	.223	10.915
	[3.maitalstatus=2]	1.245	1.238	1.011	1	.315	3.473	.307	39.310
	[3.maitalstatus=3]	.654	1.330	.242	1	.623	1.923	.142	26.051
	[3.maitalstatus=4]	0[b]	.	.	0	.	.	.	.
	[4.religion=1]	12.092	1247.576	.000	1	.992	178349.519	.000	.[c]
	[4.religion=2]	13.027	1247.575	.000	1	.992	454588.291	.000	.[c]
	[4.religion=3]	8.172	1247.576	.000	1	.995	3539.851	.000	.[c]
	[4.religion=4]	0[b]	.	.	0	.	.	.	.
	[5.residenceperiod=1]	.610	1.431	.182	1	.670	1.841	.111	30.398
	[5.residenceperiod=2]	-1.409	.977	2.079	1	.149	.244	.036	1.659
	[5.residenceperiod=3]								
	[5.residenceperiod=4]								
	[6.householdsize=1]								
yes		-.685	.824	.691	1	.406	.504	.100	2.533

	[6.householdsize=2]	0[b]	.	.	0	.	.	.	.
	[6.householdsize=3]	.140	1.298	.012	1	.914	1.151	.090	14.652
	[6.householdsize=4]	1.531	1.002	2.332	1	.127	4.622	.648	32.964
	[7.natureofhousehold=1]	.645	.942	.469	1	.493	1.907	.301	12.091
		0[b]	.	.	0	.	.	.	.
		-.758	.808	.882	1	.348	.468	.096	2.281

[18.constructionmaterial=1]	[8.educationlevel=1]	1.752	1.199	2.135	1	.144	5.765	.550	60.442
[18.constructionmaterial=2]	[8.educationlevel=2]	-12.620	1949.756	.000	1	.995	3.000E-006	.000	.
[18.constructionmaterial=3]	[8.educationlevel=3]	-12.763	1949.751	.000	1	.995	2.865E-006	.000	.
[18.constructionmaterial=4]	[8.educationlevel=4]	-13.569	1949.751	.000	1	.994	1.158E-006	.000	.
[18.constructionmaterial=5]	[8.educationlevel=5]	-13.569	1949.751	.000	1	.994	1.158E-006	.000	.
[9.educationallevel=1]	[18.constructionmaterial=1]	-2.915	1.277	5.210	1	.022	.054	.004	.662
[9.educationallevel=2]	[18.constructionmaterial=2]	-4.268	1.980	4.646	1	.031	.014	.000	.584
[9.educationallevel=3]	[18.constructionmaterial=3]	-2.945	1.347	4.783	1	.029	.053	.004	.688
[9.educationallevel=4]	[18.constructionmaterial=4]	-2.945	1.347	4.783	1	.029	.053	.004	.688
[9.educationallevel=5]	[18.constructionmaterial=5]	-2.945	1.347	4.783	1	.029	.053	.004	.688
[10.income=1]	[8.educationlevel=1]	-.124	1.610	.006	1	.939	.884	.038	20.743
[10.income=2]	[8.educationlevel=2]	0[b]	.	.	0	.	.	.	.
[10.income=3]	[8.educationlevel=3]	.423	.727	.338	1	.561	1.526	.367	6.347
[10.income=4]	[8.educationlevel=4]	-2.286	1.541	2.199	1	.138	.102	.005	2.087
[10.income=5]	[8.educationlevel=5]	-1.026	1.285	.638	1	.425	.358	.029	4.447
[11.sourceofincome=1]	[8.educationlevel=1]	-.949	1.297	.535	1	.464	.387	.030	4.921
[11.sourceofincome=2]	[8.educationlevel=2]	-.892	1.436	.386	1	.535	.410	.025	6.840
[11.sourceofincome=3]	[8.educationlevel=3]	-.375	.763	.242	1	.623	.687	.154	3.067
[11.sourceofincome=4]	[8.educationlevel=4]	-.280	1.162	.058	1	.810	.756	.077	7.374
[11.sourceofincome=5]	[8.educationlevel=5]	-2.346	1.088	4.646	1	.031	.096	.011	.808
21.pollutenearbywatersources=1]	[8.educationlevel=1]	-.494	1.010	.240	1	.624	.610	.084	4.413
[21.pollutenearbywatersources=2]	[8.educationlevel=2]	-.485	.947	.262	1	.609	.616	.096	3.939
21.pollutenearbywatersources=	[8.educationlevel=3]	0[b]	.	.	0	.	.	.	.
	[8.educationlevel=4]	0[b]	.	.	0	.	.	.	.

13.doyouknowanecologicalsanitation=1]	.123	.695	.031	1	.859	1.131	.290	4.414
[13.doyouknowanecologicalsanitation=2]	0[b]	.	.	0	.	.	.	.
3] [	.656	.948	.478	1	.489	1.927	.301	12.350
22.builtinmostdifficultenvironments=1]								
[22.builtinmostdifficultenvironments=2]	-.128	.652	.039	1	.844	.880	.245	3.157
[22.builtinmostdifficultenvironments=3]	0[b]	.	.	0	.	.	.	.

	[23.costofmaintainance=1]	-1.608	2537.462	.000	1	.999	.200	.000	.[c]
	[23.costofmaintainance=2]	-3.217	2537.462	.000	1	.999	.040	.000	.[c]
	[23.costofmaintainance=3]	0[b]	.	.	0	.	.	.	.
	[24.dignity=1]	.542	1.105	.241	1	.624	1.719	.197	14.982
	[24.dignity=2]	-.062	.861	.005	1	.943	.940	.174	5.085
	[24.dignity=3]	0[b]	.	.	0	.	.	.	.
	[25.security=1]	1.709	1.062	2.591	1	.107	5.524	.689	44.259
	[25.security=2]	-3.483	1.165	8.940	1	.003	.031	.003	.301
	[25.security=3]	0[b]	.	.	0	.	.	.	.
	[26.genderspecific=1]	-1.274	.828	2.370	1	.124	.280	.055	1.416
	[26.genderspecific=2]	-.362	.973	.138	1	.710	.696	.103	4.691
	[26.genderspecific=3]	0[b]	.	.	0	.	.	.	.
	[30.emptyingofurineexcretacontainersregularly=1]	1.049	1.036	1.026	1	.311	2.854	.375	21.729
	[30.emptyingofurineexcretacontainersregularly=2]	-.129	.723	.032	1	.858	.879	.213	3.628
	[30.emptyingofurineexcretacontainersregularly=3]	0[b]	.	.	0	.	.	.	.
	Intercept	-2.590	1485.629	.000	1	.999			
	[1.gender=1]	-.286	.435	.433	1	.510	.751	.320	1.762
no	[1.gender=2]	0[b]	.	.	0	.	.	.	.
	[2.age=1]	2.176	1.505	2.090	1	.148	8.811	.461	168.382

[2.age=2]

[2.age=3]

[2.age=4]

[2.age=5]

[3.maitalstatus=1]

[3.maitalstatus=2]

[3.maitalstatus=3]

[3.maitalstatus=4]

[4.religion=1]

[4.religion=2]

[4.religion=3]

[4.religion=4]

[5.residenceperiod=1]

[5.residenceperiod=2]

[5.residenceperiod=3]

[5.residenceperiod=4]

[6.householdsize=1]

[6.householdsize=2]

[6.householdsize=3]

[6.householdsize=4]

[7.natureofhousehold=1]

[7.natureofhousehold=2]

[8.ethnicgroup=1]

[8.ethnicgroup=2]

[8.ethnicgroup=3]

[8.ethnicgroup=4]

[9.educationallevel=1]

[9.educationallevel=2]

[9.educationallevel=3]

[9.educationallevel=4]

[10.income=1]

[10.income=2]

[10.income=3]

[10.income=4]

[10.income=5]

[11.sourceofincome=1]

		2.204	1.409	2.448	1	.118	9.063	.573	143.400
		1.825	1.418	1.655	1	.198	6.200	.385	99.901
		2.088	1.496	1.949	1	.163	8.070	.430	151.335
	[11.sourceofincome=2]	0[b]	.	.	0	.	.	.	.
	[11.sourceofincome=3]	1.599	.729	4.818	1	.028	4.950	1.187	20.646
	[11.sourceofincome=4]	1.431	.846	2.862	1	.091	4.182	.797	21.942
	[11.sourceofincome=5]	1.351	.858	2.478	1	.115	3.861	.718	20.753
	[	0[b]	.	.	0	.	.	.	.
		12.877	943.078	.000	1	.989	391341.998	.000	.[c]
		13.193	943.078	.000	1	.989	536358.720	.000	.[c]
		12.463	943.078	.000	1	.989	258531.913	.000	.[c]
		0[b]	.	.	0	.	.	.	.
		2.676	.944	8.044	1	.005	14.529	2.286	92.351
		1.533	.700	4.797	1	.029	4.633	1.175	18.270
		1.293	.686	3.557	1	.059	3.643	.951	13.964
		0[b]	.	.	0	.	.	.	.
		.578	.855	.457	1	.499	1.783	.334	9.533
		.892	.769	1.345	1	.246	2.441	.540	11.026
	13.doyouknowanecologicalsanitation=1]	.649	.689	.889	1	.346	1.914	.496	7.379
		0[b]	.	.	0	.	.	.	.

[	-1.663	.650	6.555	1	.010	.190	.053	.677
13.doyouknowanecologicalsanitation=2]	0[b]	.	.	0	.	.	.	.
[18.constructionmaterial=1]	-.343	.581	.347	1	.556	.710	.227	2.218
[18.constructionmaterial=2]	.528	.551	.917	1	.338	1.695	.576	4.992
[18.constructionmaterial=3]	.827	.000	.	1	.	2.287	2.287	2.287
[19.materialcost=1]								
[19.materialcost=2]								
[19.materialcost=3]								
[19.materialcost=4]								

		0[b]	.	.	0	.	.	.	.
		.520	1.226	.180	1	.671	1.683	.152	18.610
		-.729	1.190	.376	1	.540	.482	.047	4.965
		-.031	1.151	.001	1	.978	.969	.102	9.249
		0[b]	.	.	0	.	.	.	.
	[19.materialcost=5]	.451	1.224	.135	1	.713	1.569	.143	17.277
	[21.pollutenearbywatersources=1]	-.602	1.210	.247	1	.619	.548	.051	5.865
	[21.pollutenearbywatersources=2]	-.908	1.213	.559	1	.454	.404	.037	4.352
	[21.pollutenearbywatersources=3]	-.390	1.281	.093	1	.761	.677	.055	8.341
	[22.builtinmostdifficultenvironments=1]	0[b]	.	.	0	.	.	.	.
	[22.builtinmostdifficultenvironments=2]	-.450	.741	.369	1	.544	.638	.149	2.725
	[22.builtinmostdifficultenvironments=3]	.091	.698	.017	1	.896	1.096	.279	4.304
	[23.costofmaintainance=1]	.304	.762	.159	1	.690	1.355	.304	6.031
	[23.costofmaintainance=2]	-.277	.711	.151	1	.697	.758	.188	3.057
	[23.costofmaintainance=3]	0[b]	.	.	0	.	.	.	.
	[24.dignity=1]	-1.648	.548	9.046	1	.003	.192	.066	.563

	.740	.631	1.375	1	.241	2.096	.608	7.226
	-.555	.789	.496	1	.481	.574	.122	2.692
	0[b]	.	.	0	.	.	.	.
	.406	.931	.190	1	.663	1.501	.242	9.315

	.735	.914	.647	1	.421	2.086	.348	12.513
	1.161	1.168	.988	1	.320	3.193	.324	31.487
	2.058	1.028	4.013	1	.045	7.833	1.046	58.689
	0[b]	.	.	0	.	.	.	.
	.449	.545	.679	1	.410	1.567	.538	4.559
	.085	.463	.033	1	.855	1.088	.439	2.696
	0[b]	.	.	0	.	.	.	.
	2.033	.694	8.583	1	.003	7.638	1.960	29.765
	1.057	.482	4.804	1	.028	2.879	1.118	7.411
	0[b]	.	.	0	.	.	.	.

	-17.327	1147.908	.000	1	.988	2.984E-008	.000	.[c]
	-18.385	1147.908	.000	1	.987	1.036E-008	.000	.[c]
	0[b]	.	.	0	.	.	.	.
	.016	.704	.001	1	.982	1.016	.256	4.039

[24.dignity=2]	.383	.596	.413	1	.521	1.467	.456	4.721
[24.dignity=3]	0[b]	.	.	0	.	.	.	.
[25.security=1]								
[25.security=2]	-.680	.803	.717	1	.397	.507	.105	2.444
[25.security=3]	-.715	.666	1.150	1	.284	.489	.133	1.807
[26.genderspecific=1]	0[b]	.	.	0	.	.	.	.
[26.genderspecific=2]	1.152	.746	2.385	1	.122	3.166	.733	13.666
[26.genderspecific=3]	1.218	.739	2.719	1	.099	3.380	.795	14.379
[	0[b]	.	.	0	.	.	.	.
30.emptyingofurineexcretacontainersregularly=1]	.831	.741	1.257	1	.262	2.295	.537	9.803
[30.emptyingofurineexcretacontainersregularly=2]	.506	.627	.652	1	.419	1.659	.486	5.663
[30.emptyingofurineexcretacontainersregularly=3]	0[b]	.	.	0	.	.	.	.

a. The reference category is: not sure.

b. This parameter is set to zero because it is redundant.

c. Floating point overflow occurred while computing this statistic. Its value is therefore set to system missing.