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Transforming Lachaqui: Environmental Education and Waste Management for a Better Quality of Life

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Abstract
With the passage of time, the environment has been degenerating due to the inaction of people, who contribute through the generation of solid waste due to high consumption, added to this by the municipal authorities, who do little or nothing to ensure that the situation changes, finding that the quality of life is deteriorated. To carry out an analysis of this problem, several publications have been reviewed that show that this situation is general in several countries.
Keywords: Environmental Education, Waste Management, Quality of Life.
Resumen
Con el paso del tiempo, se ha ido degenerando el medio ambiente a causa de la inacción de las personas, quienes contribuyen mediante la generación de residuos sólidos por el elevado consumo, a ello se suma las autoridades municipales, que poco o nada hacen para que la situación cambie, encontrándose que la calidad de vida se vea desmejorada. Para realizar un análisis de esta problemática, se ha revisado varias publicaciones que demuestran que esta situación es general a nivel de varios países.
Palabras claves: Educación Ambiental, Gestión de Residuos, Calidad de vida.

Introduction

Around 5,000 B.C., from the era in which ancient settlers began their sedentary lifestyle, and at same time the first colonisations appeared, which little by little became small cities, which began to generate waste, which is called urban solid waste (USW), and which is relocated in places that do not cause displeasure to inhabitants of these areas. In this sense, due to its constant accumulation, they began to locate places to dump their waste, and the first rubbish collectors began to appear (Paredes, 2023). In this sense, we can indicate that with the passing of time, the small cities formed have been growing due to the increase in population, resulting in the existence of over-dimensioned cities, with inhabitants who often do not take care in disposing of their solid waste. Similarly, we can cite lack of collection services for MSW generated in households. The accumulation of rubbish in cities directly affects their appearance, as it brings with it environmental pollution, the appearance of rodents, insects and, as a result, the appearance of diseases. This generates a bad image in the cities, contributing to tourism absenteeism (Lozano, et al., 2023).

Globally, a large amount of waste is generated, and an adequate collection service is not provided, thus causing a deterioration of the ornamental appearance of cities. This situation is more notorious in Latin America, due to the fact that population settlements contribute to

uncontrolled growth and, added to this, the lack of interest of the authorities, (Aroni, 2023). In this sense, solid waste is generated by the waste that people (natural or legal) produce during a certain period of time, accumulating it in their own spaces, so that the responsible entity is then responsible for its collection and final disposal, (Intriago, et al., 2024). With the passing of the years, environmental pollution has been representing an arduous challenge for the comfort of humanity and the quality of integral life, inevitably involving the educational community and our homes, motivated by the lack of environmental awareness of inhabitants in order to assume changes in pursuit of an efficient posture for the welfare of future generations, (Ruiz, et al., 2024), 2024); the management of solid waste is a multifaceted difficulty, which includes political, socio-economic, institutional and environmental aspects, making it a very important problem due to incessant population growth, together with lack of environmental knowledge of the authorities and the population in general, contributing to the deterioration of nature, Palacios, et al.

On the other hand, there is a general neglect of environment, in highly industrialised countries, pollution is seriously harmful, causing consequences for human health, and even more so in developing nations; this situation is due to fact that with passage of time, there is an excessive growth of society which in turn generates excessive changes in consumption habits and this is generating solid waste that generates highly worrying difficulties, causing damage to nature and to the population itself, Valiente, et al, (2023); the leaders of the various countries have been proposing mechanisms to provide citizens with quality public services that can provide them with health security, Peña, et al., (2023); however, the management of urban solid waste represents a difficulty merits an immediate solution at a global level, as it must be taken into account that the increase in population in a disorderly manner is becoming a component that will worsen current reality, Miranda, et al., (2024). Year after year, the large amount of solid waste production is mainly due to the bad consumption habits of mankind, mainly concentrated in the big cities where the inhabitants do not have an environmental culture, it can be seen that waste is thrown into the streets without proper classification or without due care, which is then exposed to the open air by the action of animals, Angulo (2024); If, on the other hand, waste is properly separated or classified, it would allow the identification of materials that could be recycled or reused, considerably reducing the amount of waste that is transferred to a final destination and benefit would be the reduction of environmental pollution, Reyes, et al. , (2024).

In Peru, the high concentration of inhabitants is found in the large metropolis of Lima, with a high percentage of neighbourhoods that were created without the participation of the authorities and without basic services. The imperfections of public administrators in meeting basic needs are complemented by norms do not contribute much to adequate planning and decision-making for good urban planning. The environmental pollution of these neighbourhoods shows how affected they are by the neglect of the large accumulation of rubbish in the streets, generating a strong odour. In addition, due to the lack of public policy planning, with the aim of solving the problems of uncontrolled city expansionism and without a vision of the future, with the aim of substantially improving the quality of life of the inhabitants, have contributed to the fact that the so-called sanitary landfills, in most cities, do not have a process of technification, and as a consequence of this is a centre that generates high environmental pollution (Urure, et al., 2024). The spread of solid waste, due to high human consumption, is the main cause of environmental pollution, making it a very worrying situation, Murrugarra (2021); Murrugarra (2021) states that it is necessary to generate an integrated discipline for knowledge of solid waste management from the moment it starts to

be generated, as well as the storage, transfer and final disposal of waste, with the aim of improving the quality of life of population, therefore, the knowledge of the use of solid waste is the responsibility of authorities and citizens in general, instilling knowledge from the educational environment, Urure, et al. , (2024. In the district of Lachaqui, the above is no different with regard to the actions of the authorities, where solid waste generated by the inhabitants is found in the streets, causing environmental pollution. During the last few years, public policies that could provide a solution to this situation have not been given the importance they deserve, and in addition, the population does not collaborate with the improvement of the environment. This represents a very pressing problem which requires the formulation of a proposal for the treatment of solid waste in a direct way and which allows the environment in the district of Lachaqui not to be affected by the vulnerability of this threat.

People have a convenient disposition to be able to understand the care of the environment, and this is the main challenge for the initial promotion of a change in environmental culture, developing habits of sustainability for humanity and protection of our nature, Aranda, et al, (2023); therefore, when human being improves his environmental awareness is that he can glimpse his environment where he naturally develops, improving his posture, behaviour and ethics by reason of his understanding and the use of skills for understanding, (Rodriguez, 2024); To achieve an improvement of the environmental awareness of the person is the use of the instruction supported in games, has exercised a rapid increase at the level of the world, stabilising itself as a powerful instrument very effective for a diversity of sectors and disciplines, (Cantillo, 2024); For it, it is necessary that a methodology of instruction is developed adapting to the context where the instruction is going to be carried out, taking into account the participants and with strategies for the achievement of the objectives, Chinachi, et al. , (2024). The environmental deterioration of the district of Lachaqui, is becoming very noticeable, there is overcrowding of solid waste in the streets, including waste from the construction of buildings, demolition of old houses, waste from pets, which seriously alter ecosystems and contribute to climate change, deteriorating quality of life of citizens, in that sense, this problem is directly related to the SDG 12.- Responsible production and consumption.

Development

The generation of solid waste due to human consumption or development of economic activities, has been since ancient times, the same that by exposure to nature degrade easily, causing environmental pollution, and with passage of time, has been worsening with large industries, processing and production of goods, generating in turn, waste with greater complexity that contribute to greater environmental pollution, damaging human health. The increase in population has brought with it amplification of consumption and therefore the increase of solid waste, making the management and collection of solid waste more and more complicated for entities responsible for its treatment.

There is a latent danger of contaminating the air, water and soil due to irresponsible waste management, leading to the exposure of people to a highly polluted environment, and this situation is compounded by the poor management of municipalities on this issue, including rubbish dumps without the necessary care, becoming infectious foci, and therefore it is extremely urgent that measures are taken to address this problem that affects public health, Herrera, et al, (2023); it should be taken into account that people's consumption generates solid waste on a daily basis, and municipal authorities are not able to adequately deal with solid waste management. In our country, through the Ministry of the Environment,

investment projects are being carried out in various localities, especially in environmental education for people, with the aim of reducing the risks of environmental pollution and affecting people's health, Carlín, et al.

However, the responses and important actions of state entities, especially related to people's health, have been committing the transversal efforts of various sectors, and through this, the aim is to stop the contagious effects at the community level, García (2022); in order for these responses and actions to be successful, it is necessary to have access to financial capital, that the municipalities do not lack funds to face these problems, that people have full knowledge of the risks of pollution due to poor solid waste management, and that there is adequate collection and disposal. Therefore, municipalities should not be the only ones responsible for the care of the environment, but the community as a whole, including Legislative Decree No. 1278 (2017) which requires citizens to pay arbitration fees for the cleaning service, Yrigoin, et al.

Environmental education represents a fundamental axis for the reduction of environmental pollution. The accumulation of solid waste in the streets of the district of La Perla is a constant and visible phenomenon, as is the low capacity of the municipality to collect and dispose of the waste.

Furthermore, the current educational programmes have not yielded the anticipated outcomes. This is due to a lack of awareness among citizens regarding the extent of environmental pollution, which has led to a decline in waste collection. It is estimated that only 10% of citizens engage in regular recycling practices, while 85% are unaware of the procedures for the proper management of solid waste. Therefore, the lack of citizen awareness represents a significant barrier to the improvement of solid waste management.

A variety of regulatory frameworks exist to address the identified issue, as outlined below:

Law N° 27972 - Organic Law of Municipalities, municipalities promote environmental education and research in their locality.

D. S. N° 017-2012-ED, which approves the National Policy on Environmental Education, establishes the development of environmental education and culture aimed at citizen learning.

D. S. N° 006-2019-MINAM that approves the regulation of Law N° 30884 Law that regulates single-use plastic and disposable containers or packaging.

D. S. N° 013-2019-MINAM that approves the regulation of Law N° 307545 Framework Law on Climate Change.

D. S. N° 023-2021-MINAM that approves the National Environmental Policy to 2030, which determines as priority objective 9, to improve the environmental behaviour of citizens.

D. S. N° 001-2022-MINAM that modifies the Regulation of D. L. N° 1278 Legislative Decree that approves the Law of Integral Management of Solid Waste, approved by Supreme Decree N° 014-2017-MINAM, and the Regulation of Law N° 29419, Law that regulates the activity of recyclers, approved by D. S. N° 005-2010-MINAM.

Ministerial Resolution N° 003-2023 MINAM, which approves the Instructions for the elaboration and implementation of the Municipal Programme for Environmental Education, Culture and Citizenship (Municipal Programme EDUCCA).

In light of the extant legal framework, it is anticipated that the municipal authorities of Lachaqui will be well-positioned to raise public awareness regarding the significance and urgency of effective solid waste management. To this end, the implementation of the Municipal Programme of Education, Culture and Environmental Citizenship is recommended, with the specific objective of bolstering the environmental consciousness of

the population in order to equip them with the capacity to address environmental challenges and promote the sustainable use of natural resources.

The implementation of this public policy in the Municipality of Lachaqui will foster a sense of commitment and awareness among citizens regarding the proper management of solid waste. This will lead to a notable reduction in waste on public roads and an improvement in the environmental quality and quality of life. Such implementation must be accompanied by a system of control and monitoring of the Municipal Programme for Environmental Education, Culture and Citizenship, as well as the necessary economic resources to achieve the objective. Such control should be directed towards the general public, with the participation of community and school leaders.

The present study is justified by a theoretical approach, given the critical state of the panorama presented. This allows us to apply theoretical knowledge of how to prevent contagious diseases and thereby improve environmental quality. In this regard, the practical justification is the study of the lack of awareness among families with regard to the collection of solid waste. The accumulation of waste in urban areas has a direct impact on the cityscape, contributing to environmental pollution, the proliferation of rodents, insects and unpleasant odours, and consequently, the emergence of infectious and contagious diseases.

Methodology

The methodological justification, the methods used, the processes, techniques and instruments that were used in investigation to highlight the attention to basic needs, are complemented with norms contribute a lot to an adequate organisation and decision making for good urban planning.

The lack of awareness of the management of solid waste in the district of Lachaqui, shows us the affectation of ornamentation by the excessive piling up of rubbish in the different streets and on the banks of the rivers, generating a bad image. Social justification, in short, solid waste is causing serious urban pollution in the district of Lachaqui, generating a series of contagious diseases, proliferation of flies and rodents, bad appearance of urban decoration, bad smells in the environment. Furthermore, it is important, as it is established as public policy in accordance with SDG 12 (responsible production and consumption), whose main objective is to seek to transform forms of sustainable consumption and production, which is essential to sustain livelihoods of current and future generations.

Therefore, in accordance with the above, the following general objective is pursued: To explore how environmental education processes impact on community awareness and behaviour for responsible management of solid waste, in order to identify effective educational strategies that promote sustainable practices in district of Lachaqui.

From the observation carried out, it has been found there is no progress, being a very critical issue for community, however, the existence of infectious outbreaks due to the accumulation of solid waste in the streets has been observed, finding that there is a correlation between environmental education and solid waste that affects the quality of life in the district.

The method used is a quantitative approach, due to the concrete actions followed, the techniques used and the methods employed, which guided us in compiling the figures for testing of the hypothesis (Carhuancho et al., 2019); the method adapted was hypothetical deductive (theoretical method), the design or tactic used for obtaining information that is required in an investigation, must find the answer in a satisfactory manner to problem statement, in that sense, to provide greater certainty of the results is that the design used for my chosen research is non-experimental, the variables have not been adulterated attending to

ethical reasons, and therefore will expose us influence of the RS and CA in the QoL, (Hernández and Mendoza, 2018).

The present case is oriented to the district of Lachaqui, and according to the 2017 census, it has 862 inhabitants, from which a sample of 266 was obtained, the period under evaluation is the year 2024.

Results

Description of variables

Table 1

Description of the levels of the Solid Waste variable and its dimensions.

Ranks / Levels	Low		Half		High		Total	
Variable and Dimensions	F	%	F	%	f	%	f	%
Solid Waste	2	0,8	96	36,1	168	63,2	266	100
D1: Physics	9	3,4	117	44,0	140	52,6	266	100
D2: Space	28	10,5	83	31,2	155	58,3	266	100
D3: Temporary	48	18,0	52	19,5	166	62,4	266	100
D4: Socioeconomic	12	4,5	82	30,8	172	64,7	266	100

Note: Database

Interpretation: Table 01 presents the frequencies and percentages relevant to the levels of solid waste and their dimensions. Regarding the RS variable, we observed that 0.8% of respondents indicated a low level of RS management, 36.1% reported a medium level and 63.2% indicated a high level. The same situation is present in each of the dimensions.

Table 2

Description of the levels of the Environmental Pollution variable and its dimensions

Ranks / Levels	Low		Half		High		Total	
Variable and Dimensions	F	%	F	%	Vari	F	%	F
Environmental Pollution	1	0,4	98	36,8	167	62,8	266	100
D1: Environmental	26	9,8	85	32,0	155	58,3	266	100
D2: Social	49	18,4	51	19,2	166	62,4	266	100
D3: Economic	7	2,6	119	44,7	140	52,6	266	100
D4: Spatial	11	4,1	82	30,8	173	65,0	266	100
D5: Temporal	24	9,0	89	33,5	153	57,5	266	100

Note: Database

Interpretation: Table 02 presents the frequencies and percentages relevant to the levels of CA and its dimensions. Regarding this variable, we observed that 0.4% of respondents indicated a low level of knowledge of CA, 36.8% reported a medium level and 62.8% indicated a high level. The same situation is present in each of the dimensions.

Table 3

Description of the levels of the Quality of Life variable and its dimensions

Ranks / Levels	Low		Half		High		Total	
Variable and Dimensions	F	%	F	%	Vari	F	%	F
Quality of Life	1	0,4	97	36,5	168	63,2	266	100
D1: Physical	5	1,9	87	32,7	174	65,4	266	100
D2: Social	47	17,7	48	18,0	171	64,3	266	100
D3: Economic	37	13,9	67	25,2	162	60,9	266	100
D4: Psychological	16	6,0	110	41,4	140	52,6	266	100
D5: Environmental	29	10,9	76	28,6	161	60,5	266	100

Note: Database

Interpretation: Table 03 presents those frequencies and percentages relevant to the levels of quality of life and its dimensions. Regarding the variable in question, we observed that 0.4% of respondents indicated a low level of QoL, 36.5% reported a medium level, and 63.2% indicated a high level. The same situation is present in each of the dimensions.

Hypothesis test

General hypothesis test:

H0: There would be no influence of poor solid waste management and persistent environmental pollution on the deterioration of the quality of life in the population of a district in the Lima Provinces Region-2024.

H2: There would be an influence of poor solid waste management and persistent environmental pollution on the deterioration of the quality of life in the population of a district in the Lima Provinces Region-2024.

Decision rule:

Confidence level 95%

Margin of error 5%

$\alpha = 0.05$

If p-value <0.05, reject H0

If p-value >0.05, accept H0

Table 4

Model fit information and R square explaining the influence of solid waste management and persistent environmental pollution on the deterioration of quality of life

Model	Log likelihood -2	Chi-square	G 1	Sig,	Pseudo R square	
Intersection only	352,188				Cox y Snell	,734
Final	352,188	358,188	4	0,000	Nagelkerke	,988
					McFadden	,975

Link source: Logit

The results of the regression model indicate that the significance level is 0.000, which allows us to reject the null hypothesis. In other words, there is sufficient evidence to affirm that there is a significant relationship between the management of RS and the persistent CA in the deterioration of the quality of life in the population of a district in the Lima Provinces Region-2024.

Regarding the Pseudo R square, also known as the Nagalkerke coefficient, it indicates that the QoL explains 98.8% of the variability of the management of RS and CA. In other words, the influence of the management of RS and CA in this process is very strong.

Taking into account both the significance level and the Pseudo R square, it is decided to accept the research hypothesis by not accepting the null hypothesis. This means that, based on the data analyzed, it can be concluded that the management of RS and the persistent CA in the deterioration of the QoL in the population.

Table 5
Goodness of fit of the model

	Chi-square	gl	Sig,
Pearson	0,000	6	1,000
Desvianza	0,000	6	1,000

Link function: Logit,
Additionally, the goodness of fit of the model was evaluated to determine the relationship between the variables and the proposed model. The p-value obtained was 0.000, which indicates that there is sufficient certainty to reject the null hypothesis of independence between the variables, since this value is greater than the significance level α of 0.05 (p-value > α). In other words, the results suggest that the variables are related to each other and that the proposed model is adequate.

Table 6
Parameter estimates for Solid Waste and Environmental Pollution in Quality of Life

							95% confidence interval	
		Estimate	Std Error	Wald	gl	Sig	Lower limit	Upper limit
Threshold	[QUALITY_OF_LIFE_01	-37,100	229,443	,026	1	,872	-486,800	412,59
	[QUALITY_OF_LIFE_01	-14,283	98,371	,021	1	,885	-207,087	178,52
Location	[SOLID_WASTE_01=1]	-,020	245,062	,000	1	1,000	-480,333	480,29
	[SOLID_WASTE_01=2]	6,850	158,733	,002	1	,966	-304,261	317,96
	[SOLID_WASTE_01=3]	0a	.	.	0	.	.	.
	[ENVIRONMENTAL_POLLUTION_01=1]	-51,004	1107,376	,002	1	,963	-2221,420	2119,412
	[ENVIRONMENTAL_POLLUTION_01=2]	-25,666	186,739	,019	1	,891	-391,667	340,336
	[ENVIRONMENTAL_POLLUTION_01=3]	0a	.	.	0	.	.	.

Link function: Logit.
a. This parameter is set to zero because it is redundant.
According to the significance results, there are influences of the variables CdV at the low level where p value = 0.000 < 0.05 and at the high level with p = 0.885 > 0.05, the RS at the high levels p = 1.000 > 0.05 and p = 0.966 > 0.05 on the QoL, the CA at the high levels p = 0.963> 0.05 and p = 0.891 > 0.05, it is decided to accept the research hypothesis by rejecting the null hypothesis. In summary, the management of the RS and the persistent CA affect the QoL.

Specific hypotheses
Specific hypothesis 1
H0: There would be no influence of the poor management of solid waste management and persistent environmental pollution on the physical deterioration of a district in the Lima Provinces Region-2024.
H2: There would be an influence of poor solid waste management and persistent environmental pollution on the physical deterioration of a district in the Lima Provinces Region-2024.

Table 7
Information on the model fit and R square that explains the influence of solid waste and persistent environmental pollution on physical deterioration.

Model	Log likelihood -2	Chi-square	Gl	Sig,	Pseudo R square	
Intersection	299,948				Cox y Snell	,663
Final	10,827	289,121	4	0.000	Nagelkerke	,870
					McFadden	,757

Link function: Logit.
After introducing the data into the regression model, it is observed that it presents statistical significance ($p > 0.05$). However, this does not imply that the model is valid and allows the analysis to continue.
Regarding the Pseudo R square test, also known as the Nagalkerke coefficient, it indicates that the RS and the persistent CA explain 87.0% of the variability of the tangible elements related to the physical deterioration of the QoL. In other words, the influence of the RS and the persistent CA in this aspect is very high.
Taking into account both the level of significance and the Pseudo R square, it is decided to accept the research hypothesis, rejecting the null hypothesis. This means that, based on the data analyzed, it can be concluded that the RS and the CA have a significant impact on the physical deterioration of the QoL.

Table 8
Goodness of fit of the model

	Chi-square	gl	Sig,
Pearson	0,369	6	,999
Desvianza	0,636	6	,996

Link function: Logit.
This section presents the results of the variable goodness-of-fit test. The results indicate that there is no independence between the variables analyzed, which is confirmed by the statistical value of p-value (0.999) when compared with the significance level α (0.05). Since the p-value is greater than α (p-value > α), it can be concluded that the model and the results obtained support the dependence between the variables.

Table 9
Parameter estimates regarding solid waste and persistent environmental pollution in physical deterioration.

		95% confidence interval						
		Estimate	Std Erro	Wald	gl	Sig	Lower limit	Upper limit
Threshold	[cv_Fisica_01 = 1]	-11,071	1,22	81,91	1	,00	-8,673	
	[cv_Fisica_01 = 2]	-5,270	1,02	26,42	1	,00	-7,279	-3,260
Location	[SOLID_WASTE_01=1]	-29,882	3,44	75,38	1	,00	-	-
	[SOLID_WASTE_01=2]	-5,575	1,48	14,09	1	,00	-8,485	-2,665
	[SOLID_WASTE_01=3]	0a	.	.	0	.	.	.
	[ENVIRONMENTAL_POLLUTION_01	21,712	,000	.	1	.	21,71	21,71
	[ENVIRONMENTAL_POLLUTION_01	-2,364	1,31	3,232	1	,07	-4,940	,213
	[ENVIRONMENTAL_POLLUTION_01	0a	.	.	0	.	.	.

Link function: Logit.

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

The results of the significance analysis reveal that the variables "solid waste and environmental pollution" exert a significant influence on the tangible elements of physical deterioration at the low and high levels. This is evidenced by the following findings:

Low level: The p value (14.099) is less than the significance level α (0.05), indicating that there is a statistically significant relationship between the RS and the CA at the low level and the tangible elements of physical deterioration.

High level: The p value (81.491) is greater than the significance level α (0.05), suggesting that there is sufficient evidence to establish a statistically significant relationship between the RS and the CA at the high level and the tangible elements of physical deterioration.

Based on the results, it can be concluded that when the RS and the CA are at a low level, there is a significant association with a low level of tangible elements of physical deterioration. Similarly, when the RS and the CA are at a high level, a statistically significant relationship with physical deterioration is observed.

Specific hypothesis 2

H0: There would be no influence of poor solid waste management and persistent environmental pollution on the social deterioration of a district in the Lima Provinces Region-2024.

H2: There would be an influence of poor solid waste management and persistent environmental pollution on the social deterioration of a district in the Lima Provinces Region-2024.

Table 10

Information on the model fit and R square that explains the influence of solid waste and persistent environmental pollution on social deterioration.

Model	Log likelihood -2	Chi-square	Gl	Sig,	Pseudo R square	
Intersection only	284,568				Cox y Snell	,637
Final	15,226	269,341	4	0.000	Nagelkerke	,763
					McFadden	,563

Link function: Logit.

After introducing the data into the regression model, it is observed that it presents statistical significance (p > 0.05). Therefore, this implies that the model is valid, and that it allows continuing with the analysis.

As for the Pseudo R square test, also known as the Nagalkerke coefficient, it indicates that the RS and the CA explain 76.3% of the variability of the tangible elements related to social deterioration. In other words, the influence of the RS and the CA in this aspect is highly positive.

Taking into account both the level of significance and the Pseudo R square, it is decided to accept the research hypothesis and reject the null hypothesis. This means that, based on the data analyzed, it is concluded that the RS and the CA have a significant impact on social deterioration.

Table 11

Goodness of fit of the model.

	Chi-square	gl	Sig,
Pearson	1,237	6	,975
Desvianza	2,073	6	,913

Link function: Logit.

This section presents the results of the variable goodness-of-fit test. The results indicate that there is dependence between the variables analyzed, which is confirmed by the statistical value of p-value (0.975) when compared with the significance level α (0.05). Since the p-value is greater than α (p-value > α), it can be concluded that the model and the results obtained support the dependence between the variables.

Table 12

Parameter estimates for solid waste and persistent environmental pollution in social deterioration.

							95% confidence interval	
		Estimate	Std Error	Wald	gl	Sig	Lower limit	Upper limit
Threshold	[CV_Social_01 = 1]	-6,595	,665	98,200	1	,000	-7,899	-5,290
	[CV_Social_01 = 2]	-3,812	,520	53,804	1	,000	-4,831	-2,794
Location	[SOLID_WASTE_01=1]	-23,617	9627,359	,000	1	,998	-	18845,66
	[SOLID_WASTE_01=2]	-4,475	1,124	15,849	1	,000	-6,678	-2,272
	[SOLID_WASTE_01=3]	0a	.	.	0	.	.	.
	[ENVIRONMENTAL_POLLUTION_01=1]	-2,016	,000	.	1	.	-2,016	-2,016
	[ENVIRONMENTAL_POLLUTION_01=2]	-2,016	1,097	3,375	1	,066	-4,167	,135
	[ENVIRONMENTAL_POLLUTION_01=3]	0a	.	.	0	.	.	.

Link function: Logit.

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

The results of the significance analysis reveal that the variables "RS and CA" exert a significant influence on the tangible elements of social deterioration at the low and high levels. This is evidenced by the following findings:

Low level: The p value (0.000) is less than the significance level α (0.05), indicating that there is a statistically significant relationship between the RS and CA at the low level and the tangible elements of social deterioration.

High level: The p value (98.200) is greater than the significance level α (0.05), suggesting that there is sufficient evidence to establish a statistically significant relationship between the RS and CA at the high level and the tangible elements of social deterioration.

Based on the results, it can be concluded that when the RS and CA are at a low level, there is a significant association with a low level of tangible elements of social deterioration. Similarly, when the RS and the CA are at a high level, a statistically significant relationship with the tangible elements of social deterioration is observed.

Specific hypothesis 3

H0: There would be no influence of poor solid waste management and persistent environmental pollution on the economic deterioration of a district in the Lima Provinces Region-2024.

H2: There would be an influence of poor solid waste management and persistent environmental pollution on the economic deterioration of a district in the Lima Provinces Region-2024.

Table 13
Information on the model fit and R square that explains the influence of solid waste and persistent environmental pollution on economic deterioration.

Model	Log likelihood -2	Chi-square	Gl	Sig,	Pseudo R square	
Intersection only	290,416				Cox y Snell	,645
Final	14,926	275,490	4	,000	Nagelkerke	,766
					McFadden	,561

Link function: Logit.

After introducing the data into the regression model, it is observed that it presents statistical significance ($p > 0.05$). This implies that the model is valid, since it allows continuing with the analysis.

Regarding the Pseudo R square test, also known as the Nagalkerke coefficient, it indicates that the RS and the CA explain 76.6% of the variability of the tangible elements related to the economic deterioration. In other words, the influence of the RS and the CA in this aspect is very high.

Taking into account both the level of significance and the Pseudo R square, it is decided to accept the research hypothesis and reject the null hypothesis. This means that, based on the data analyzed, it can be concluded that the RS and the CA have a significant impact on the economic deterioration.

Table 14
Goodness of fit of the model.

	Chi-square	gl	Sig,
Pearson	1,844	6	,933
Desvianza	3,154	6	,789

Link function: Logit.

This section presents the results of the variable goodness-of-fit test. The results indicate that there is dependence between the variables analyzed, which is confirmed by the statistical value of p-value (0.933) when compared with the significance level α (0.05). Since the p-value is greater than α (p-value > α), it can be concluded that the model and the results obtained support the dependence between the variables.

Table 15
Parameter estimates for solid waste and persistent environmental pollution in economic deterioration.

		95% confidence interval						
		Estimate	Std Error	Wald	gl	Sig	Lower limit	Upper limit
Threshold	[CV_Economica_01 = 1]	-7,123	,709	100,91	1	,00	-8,513	-5,734
	[CV_Economica_01 = 2]	-3,013	,364	68,341	1	,00	-3,727	-2,298
Location	[SOLID_WASTE_01=1]	,429	2,63	,027	1	,87	-4,725	5,583
	[SOLID_WASTE_01=2]	-1,122	1,14	,956	1	,32	-3,371	1,127
	[SOLID_WASTE_01=3]	0a	.	.	0	.	.	.
	[ENVIRONMENTAL_POLLUTION_01	-26,366	,000	.	1	.	-	-
	[ENVIRONMENTAL_POLLUTION_01	-5,497	1,24	19,467	1	,00	-7,940	-3,055
	[ENVIRONMENTAL_POLLUTION_01	0a	.	.	0	.	.	.

Link function: Logit.
a. This parameter is set to zero because it is redundant.
The results of the significance analysis reveal that the variables "RS and CA" exert a significant influence on the tangible elements of economic deterioration at the low and high levels. This is evidenced by the following findings:
Low level: The p value (0.027) is lower than the significance level α (0.05), indicating that there is a statistically significant relationship between the RS and CA at the low level and the tangible elements of economic deterioration.
High level: The p value (100.917) is higher than the significance level α (0.05), suggesting that there is sufficient evidence to establish a statistically significant relationship between the RS and CA at the high level and the tangible elements of economic deterioration.
Based on the results, it can be concluded that when the RS and CA are at a low level, there is a significant association with a low level of tangible elements of participatory democracy. On the other hand, when the RS and the CA are at a high level, a statistically significant relationship with the tangible elements of economic deterioration is observed.

Specific hypothesis 4

H0: There would be no influence of poor solid waste management and persistent environmental pollution on the psychological deterioration of a district in the Lima Provinces Region-2024.
H2: There would be an influence of poor solid waste management and persistent environmental pollution on the psychological deterioration of a district in the Lima Provinces Region-2024.

Table 16

Information on the model fit and R square that explains the influence of solid waste and persistent environmental pollution on psychological deterioration.

Model	Log likelihood -2	Chi-square	Gl	Sig,	Pseudo R square
Intersection only	238,225				Cox y Nagelkerk ,57 ,69 ,48
Final	13,473	224,752	4	0.000	

Link function: Logit.

After introducing the data into the regression model, it is observed that it presents statistical significance (p > 0.05). Therefore, this implies that the model is valid, and that it allows continuing with the analysis.
Regarding the Pseudo R square test, also known as the Nagalkerke coefficient, it indicates that the RS and the CA explain 69.1% of the variability of the tangible elements related to psychological deterioration. In other words, the influence of the RS and the CA in this aspect is very high.
Taking into account both the level of significance and the Pseudo R square, it is decided to accept the research hypothesis, rejecting the null hypothesis. This means that, based on the data analyzed, it can be concluded that the RS and the CA have a significant impact on psychological deterioration.

Table 17
Goodness of fit of the model.

	Chi-square	gl	Sig,
Pearson	1,393	6	,966
Desvianza	2,171	6	,903

Link function: Logit.

This section presents the results of the variable goodness-of-fit test. The results indicate that there is dependence between the variables analyzed, which is confirmed by the statistical value of p-value (0.966) when compared with the significance level α (0.05). Since the p-value is greater than α (p-value > α), it can be concluded that the model and the results obtained support the dependence between the variables.

Table 18
Parameter estimates regarding solid waste and persistent environmental pollution in psychological deterioration.

							95% confidence interval	
		Estimate	Std. Error	Wald	gl	Sig.	Lower limit	Upper limit
Threshold	[Psychological_01 = 1]	-8,467	1,19	50,19	1	,00	-	-6,125
	[Psychological_01 = 2]	-1,661	,212	61,43	1	,00	-2,076	-1,246
Location	[SOLID_WASTE_01=1]	-1,445	4,26	,115	1	,73	-9,798	6,907
	[SOLID_WASTE_01=2]	-3,184	1,38	5,289	1	,02	-5,898	-,471
	[SOLID_WASTE_01=3]	0a	.	.	0	.	.	.
	[ENVIRONMENTAL_POLLUTION_01=	-26,384	,000	.	1	.	-	-
	[ENVIRONMENTAL_POLLUTION_01=	-3,619	1,37	6,957	1	,00	-6,307	-,930
	[ENVIRONMENTAL_POLLUTION_01=0a		.	.	0	.	.	.

Link function: Logit.
a. This parameter is set to zero because it is redundant.

The results of the significance analysis reveal that the variables "solid waste and environmental pollution" exert a significant influence on the tangible elements of psychological deterioration at the low and high levels. This is evidenced by the following findings:

Low level: The p value (0.115) is lower than the significance level α (0.05), indicating that there is a statistically significant relationship between solid waste and environmental pollution at the low level and the tangible elements of psychological deterioration.

High level: The p value (61.433) is higher than the significance level α (0.05), suggesting that there is sufficient evidence to establish a statistically significant relationship between solid waste and environmental pollution at the high level and the tangible elements of psychological deterioration.

Based on the results, it can be concluded that when solid waste and environmental pollution is at a low level, there is a significant association with a low level of tangible elements of psychological deterioration. On the other hand, when solid waste and environmental pollution are at a high level, a statistically significant relationship with the tangible elements of psychological deterioration is observed.

Specific hypothesis 5

H0: There would be no influence of poor solid waste management and persistent environmental pollution on the environmental deterioration of a district in the Lima Provinces Region-2024.

H2: There would be an influence of poor solid waste management and persistent environmental pollution on the environmental deterioration of a district in the Lima Provinces Region-2024.

Table 19

Information on the model fit and R square that explains the influence of solid waste and persistent environmental pollution on environmental deterioration.

Model	Log likelihood -2	Chi-square	Gl	Sig,	Pseudo R square	
Intersection	295,472				Cox y Snell	,654
Final	13,541	281,930	4	0.000	Nagelkerke	,782
					McFadden	,587

Link function: Logit.

After introducing the data into the regression model, it is observed that it presents statistical significance ($p > 0.05$). Therefore, this implies that the model is valid, and allows continuing with the analysis.

Regarding the Pseudo R square test, also known as the Nagalkerke coefficient, this indicates that the RS and the CA explain 78.2% of the variability of the tangible elements related to environmental deterioration. In other words, the influence of the RS and the CA in this aspect is very high.

Taking into account both the level of significance and the Pseudo R square, it is decided to accept the research hypothesis and reject the null hypothesis. This means that, based on the data analyzed, it can be concluded that the RS and the CA have a significant impact on environmental deterioration in a district of the Lima Region provinces 2024.

Table 20

Goodness of fit of the model.

	Chi-square	gl	Sig,
Pearson	,1263	6	,974
Desvianza	2,247	6	,896

Link function: Logit.

This section presents the results of the goodness-of-fit test for the variables. The results indicate that there is dependence between the variables analyzed, which is confirmed by the statistical value of p-value (0.974) when compared with the significance level α (0.05). Since the p-value is greater than α (p-value > α), it can be concluded that the model and the results obtained support the dependence between the variables.

Table 21
Parameter estimates for solid waste and persistent environmental pollution in environmental deterioration.

							95% confidence interval	
		Estimate	Std. Error	Wald	gl	Sig.	Lower limit	Upper limit
Threshold	[CV_Ambiental_01 = 1]	-7,889	,827	90,91	1	,00	-9,511	-6,268
	[CV_Ambiental_01 = 2]	-3,009	,364	68,22	1	,00	-3,724	-2,295
Location	[SOLID_WASTE_01=1]	,533	2,99	,032	1	,85	-5,335	6,401
	[SOLID_WASTE_01=2]	-1,026	1,25	,668	1	,41	-3,486	1,434
	[SOLID_WASTE_01=3]	0a	.	.	0	.	.	.
	[ENVIRONMENTAL_POLLUTION_01=	-27,130	,000	.	1	.	-	-
	[ENVIRONMENTAL_POLLUTION_01=	-5,982	1,39	18,42	1	,00	-8,713	-3,251
	[ENVIRONMENTAL_POLLUTION_01=0a		.	.	0	.	.	.

Link function: Logit.
a. This parameter is set to zero because it is redundant.

The results of the significance analysis reveal that the variables "solid waste and environmental pollution" exert a significant influence on the tangible elements of environmental deterioration at the low and high levels. This is evidenced by the following findings:
Low level: The p value (0.032) is lower than the significance level α (0.05), indicating that there is a statistically significant relationship between solid waste and environmental pollution at the low level and the tangible elements of environmental deterioration.
High level: The p value (90.918) is higher than the significance level α (0.05), suggesting that there is sufficient evidence to establish a statistically significant relationship between solid waste and environmental pollution at the high level and the tangible elements of environmental deterioration.
Based on the results, it can be concluded that when solid waste and environmental pollution is at a low level, there is a significant association with a low level of tangible elements of environmental deterioration. On the other hand, when solid waste and environmental pollution are at a high level, a statistically significant relationship is observed with the tangible elements of environmental deterioration.
It has been established that a number of educational proposals have been developed, as well as Cortés and Sepúlveda (2024), who argue that opportunities should be taken advantage of in educational entities that provide education related to the subject of environmental care. This should be done in a way that promotes effective and adaptable experiences for students, aligning with the reality of the entity and its surrounding context. Culque, et al. (2024) put forth the suggestion that an application be developed for the educational web with a focus on environmental management. This would serve as a readily accessible repository of environmental information, accessible to any user. However, Chinachi, et al. (2024) posit that for effective learning management, instructors should prioritize broad-scale environmental awareness and ensure that participants comprehend the objectives.
While the issue of solid waste has been widely studied, Palacios et al. (2024) argue that there is still a lack of clarity regarding environmental awareness, which is manifested in the low knowledge of people. Reyes et al. (2024) similarly assert that the management of solid waste has not changed significantly and that improvements and strategies at the educational level

are necessary to promote policies that are sustained over time and generate responsibility in citizens. Delving deeper into the subject, Urure et al. (2024) posits that an increase in knowledge of solid waste management leads to a corresponding increase in its practice. Similarly, Rodríguez (2024) asserts that enhanced knowledge should facilitate the involvement of all stakeholders, regardless of their nationality, in the development of general participation.

However, Miranda et al. (2024) argue that environmental education must plan and implement methodologies that facilitate environmental awareness. Angulo (2024) suggests that existing initiatives related to environmental awareness must be strengthened to achieve this. Yrigoin et al. (2024) propose another method for achieving this goal. (2024) posits that, in addition to environmental education, it is necessary to implement an average monthly payment system to improve the collection of solid waste. Cantillo (2024) further suggests that, in addition to the aforementioned measures, it is crucial to implement playful strategies in educational institutions, promoting the habit of reduction, reuse, and recycling, classifying solid waste according to its nature. Conversely, Aranda et al. (2023) argue that instructors are a pivotal factor in achieving the aforementioned objectives, as they are the primary point of contact with students, thus becoming a crucial element in the implementation of these strategies.

The impact of solid waste on public health is addressed by Herrera et al. (2023), who posit that the identification of the most common types of waste will facilitate more effective disposal in waste collectors. López and Oncihuay (2023) argue that environmental education must be integrated into the educational system. Valiente et al. (2023) suggest that municipalities should adopt this approach to reduce solid waste. Carlín et al. (2023) also highlight the importance of this strategy. (2023) presents a persistent and significant risk of water contamination by waste, which has the potential to cause severe environmental damage. Peña, et al., In light of these circumstances, Murrugarra (2021) posits that the lack of effective waste management and low environmental awareness are cause for concern. This is evidenced by the contamination of river waters, which has reached alarming levels. The population bears a significant portion of the responsibility for this situation.

In response to this challenge, Herrera et al. (2023) propose that municipalities implement adequate palliative measures to facilitate the development of their communities. This entails the provision of sufficient containers for the collection of solid waste.

Discussion

A fundamental objective of the project is to educate the community in environmental stewardship, with a particular focus on the classification of household solid waste. In order to achieve this objective, it is essential that the commune of Lachaqui assesses the feasibility of allocating a budget line, with a view to ensuring the most efficient contracting process.

The factors influencing the situation were identified.

One of the factors identified as influencing the situation is the lack of adequate determination by the municipality of Lachaqui of the mechanisms for raising awareness and disseminating the objectives for protecting the environment. The main factor is the absence of specialised personnel to establish methodological strategies that can have a favourable impact on the community. Another factor is the low financial resources allocated to environmental education.

A discussion of potential solutions will now be presented.

It is therefore evident that in order to achieve the proposed objective of implementing the Municipal Programme of Environmental Education, Culture and Citizenship (EDUCCA) of the District Municipality of Lachaqui, it is necessary to introduce an effective and easily

comprehensible methodology that will enable the citizens to contribute to the improvement process. In order to achieve the aforementioned objective of implementing the Municipal Programme of Environmental Education, Culture and Citizenship (EDUCCA) of the District Municipality of Lachaqui, it is necessary to implement an effective and easily comprehensible methodology that allows citizens to contribute to the improvement of the environment. This will entail the classification of solid waste generated by citizens, as well as the adequate collection and final disposal of the same. In order for this to be successfully implemented, it is essential to hire specialists in the field and to allocate a larger budget.

Description of the chosen solution

The methodology should commence with a diagnosis of the current situation, conducted in collaboration with the community. This will inform the implementation of a learning system based on popular education projects, with the objective of achieving a positive impact. The promotion of environmental citizenship necessitates the active participation of the community in the education process, thereby facilitating the critical empowerment of the environment in which it develops.

This system of community learning requires that the actors involved have an easy and deep understanding of the situation, and in turn the motivation for the involvement of all, for this, the municipality must provide sufficient space to encourage dialogue, discussion and reflection, with the purpose of learning the importance of the classification of solid waste, recycling, cultural care of the community, among others.

Conclusions

Environmental education in district of Lachaqui has a very important impact on the behavior of citizens. It is observed that there is no adequate management of solid waste due to lack of awareness and behavior of the community for responsible management of solid waste. On the other hand, the Municipality of Lachaqui has not assumed the commitment to lead an Environmental Education Program to improve the quality of life of its population. It is identified that there is a potential opportunity for improvement. Municipal authorities must become aware of the weakening of environment, which is caused by the bad habits of citizens. With the implementation of a teaching and learning methodology for proper management of solid waste, and the involvement of all actors, this will result in an improvement of environment and the quality of life.

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