

Program to Improve Public Awareness on Solid Waste Collection in the San Carlos Neighborhood, Huancayo

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ABSTRACT

Solid waste collection problems in San Carlos are not only an aesthetic problem, but also a major environmental problem of national interest. Additionally, the lack of understanding regarding the process of solid waste segregation at the source results in a loss of financial income to all residents. This research aims to raise public awareness on solid waste collection, for which a work program that included training and advertising (brochures and t-shirts) related to waste collection was carried out. Through this research, people learned about solid waste segregation, recycling, sanitary landfills, the role of municipalities, prevention, health, hygiene and safety. One of the most important results was that training and awareness-raising efforts raised people's awareness with regards to recycling, segregation and proper collection of solid waste, which contributes to the conservation of the environment.

Keywords: awareness; collection; solid waste.

INTRODUCTION

According to the Ministry of Environment (MINAM in Spanish), 20,000 tons of solid waste are generated daily in Peru, but only 17% is disposed of in sanitary landfills, which represents a problem for public health and the environment.

The city of Huancayo has the same problems as the rest of Peru. Although it has had for several years an Environmental Management Department and work plans for garbage collection and disposal, they have not yielded positive results. This may be due to the fact that greater emphasis needs to be placed on coordination between the authorities and the population in the municipalities because of the solid waste production cycle.

Should responsibilities for the solid waste problem be assigned, then the public would be first, since they are the main producers of solid waste and do not separate their garbage due to a lack of knowledge; municipalities would be in the second place, because they do not have plans for effective garbage segregation; and the lack of organized work between the municipality and the population would be third.

Proper disposal of solid waste should be environmentally friendly and should not cause damage; it should also be a source of employment for local citizens. Municipalities play an important role in developing a plan to guide the proper operation of the solid waste collection and disposal system (Oré, 2011).

Solid waste not only causes visual pollution, but also health damage in places that lack waste treatment plan, due to the lack of culture among the population and the lack of interest on the part of the Municipality of Huancayo.

In view of this problem, this research aimed to determine the influence of a training and awareness-raising program on preventive measures for the collection of household solid waste on the

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level of awareness of recycling in the San Carlos Neighborhood of Huancayo.

A descriptive study of variables, i.e., descriptive statistics (mean, standard deviation, variance and Kolmogorov-Smirnov test) and inferential analysis (Mann-Whitney U) were used to determine the effect of the implementation of a training program on the level of awareness of the population. The contribution of the study is relevant because it was concluded that it is possible to create a culture of preventive measures that positively influences the level of public awareness of recycling and environmental care by training the population.

This research is also considered innovative because the municipalities of the Junín region do not use scientific study methods for the correct segregation and collection of solid waste. Custom patterns are analyzed in this research using a qualitative approach because they change and adapt to society and also, development of events is evaluated in this research, which means that there is no manipulation of reality.

The findings of this research can be used in general in municipalities with cultural characteristics similar to those of San Carlos, Huancayo, to solve this environmental problem, which is of national interest.

Environmental Education and Training Program

Nowadays, most of the population follows the “use and throw away” principle, the same that should be replaced by “reuse and recycle”, because it enables the population to take care of the environment and also to have an income (Mamani, 2014).

Environmental awareness is a very important tool to create a culture of environmental conservation in the population, which should be part of the institutional plans of the municipalities. Awareness-raising is a strategy that helps to “*despertar sentimientos morales, estéticos, etc* [awaken moral, aesthetic, etc. feelings].” (RAE, 2011, cited in Escuela Superior de Administración Pública [ESAP], 2016b, p. 3) in human beings through activities to acquire information related to the environment, in other words, it uses tools to change habits that are harmful to the environment and train people with knowledge of sustainable development.

Environmental Culture

Environmental culture should be shaped by training to raise the population’s awareness of the world’s problems.

It is very important that the population is aware of the problems that negatively affect the environment, for which plans to strengthen environmental management should be set out (ESAP, 2016b).

According to the ESAP (2016b), environmental culture is based on three aspects. The first is communication, which allows the transmission of appropriate data to a receiver through channels according to its reality; an interaction scenario must be created. The second aspect is population participation in the solution of environmental problems; the population must be motivated by the authorities to create an environmental culture as a philosophy of life. The third aspect is evaluation that allows to observe the changes in the attitude of the recipient of the information.

Environmental Awareness Culture

The effects of current environmental problems concern the entire population, because they damage the environment where people do their activities and that, in the future, could lead to environments unsuitable for living (ESAP, 2016b).

Education must serve to multiply knowledge; therefore, environmental awareness and sensitization campaigns must be organized. Creating environmental culture is an activity of “*mejora continua que dura toda la vida* [continuous improvement that lasts a lifetime]” (ESAP, 2016b, p. 5), intended to raise awareness among all about environmental care.

Raising awareness is about creating knowledge, it is the tool through which the person recognizes his or her reality and can grow without barriers. It may be said that the human being is aware of their reality and forger of their history (Freire, 1974).

To Freire, awareness-raising was always inherent to liberation, for human beings are liberated by acquiring knowledge and normalizing reality, given that the “*trabajo humanizante no podrá ser otro que el trabajo de la desmitificación* [humanizing work cannot be other than the work of demystification]” (Freire, 1973, cited in Chesney, 2008, p. 116). Thus, it must be understood that awareness-raising depicts reality, and reality can only be understood if there is knowledge.

Freire identifies three phases for the awareness-raising process: the magical, the naive and the critical. It should be noted that an awareness-raising model based on Freire’s ideas was developed as part of an Environmental Awareness

Program (PCA in Spanish) between 1997-1999 (Chesney, 2008) (Figure 1).

Solid Waste

In 1997, the Pan American Health Organization stated that solid waste is waste that is not useful for human beings, and is also known as “garbage”; but it also points out that in some cases waste can be reused through recycling (Acurio, Rossin, Teixeira, & Zepeda, 1997). According to Lara and Velásquez (2016), solid waste can be defined “*como cualquier producto, materia o sustancia, resultante de la actividad humana o de la naturaleza, que ya no tiene más función para la actividad que lo generó* [as any product, matter or substance, resulting from human activity or nature, which no longer has any function for the activity that produced it]” (p.15).

According to Lacayo (2008), solid waste can be divided into three categories: municipal, industrial and hazardous.

Classification of Solid Waste by Origin

Household waste:

Ley No. 27314 (2000), Ley General de Residuos Sólidos [General Law on Solid Waste], defines them as waste resulting from household chores, such as food scraps, toilet paper, plastics, bottles, cardboard, single-use diapers, among other similar items.

Industrial waste:

Waste produced in industrial activities, such as fishing, mining, pharmaceutical and other similar industries (Organismo de Evaluación y Fiscalización [OEFA], 2014).

Construction waste:

Waste originated from remodeling, building and infrastructure installation works and other similar ones (OEFA, 2014).

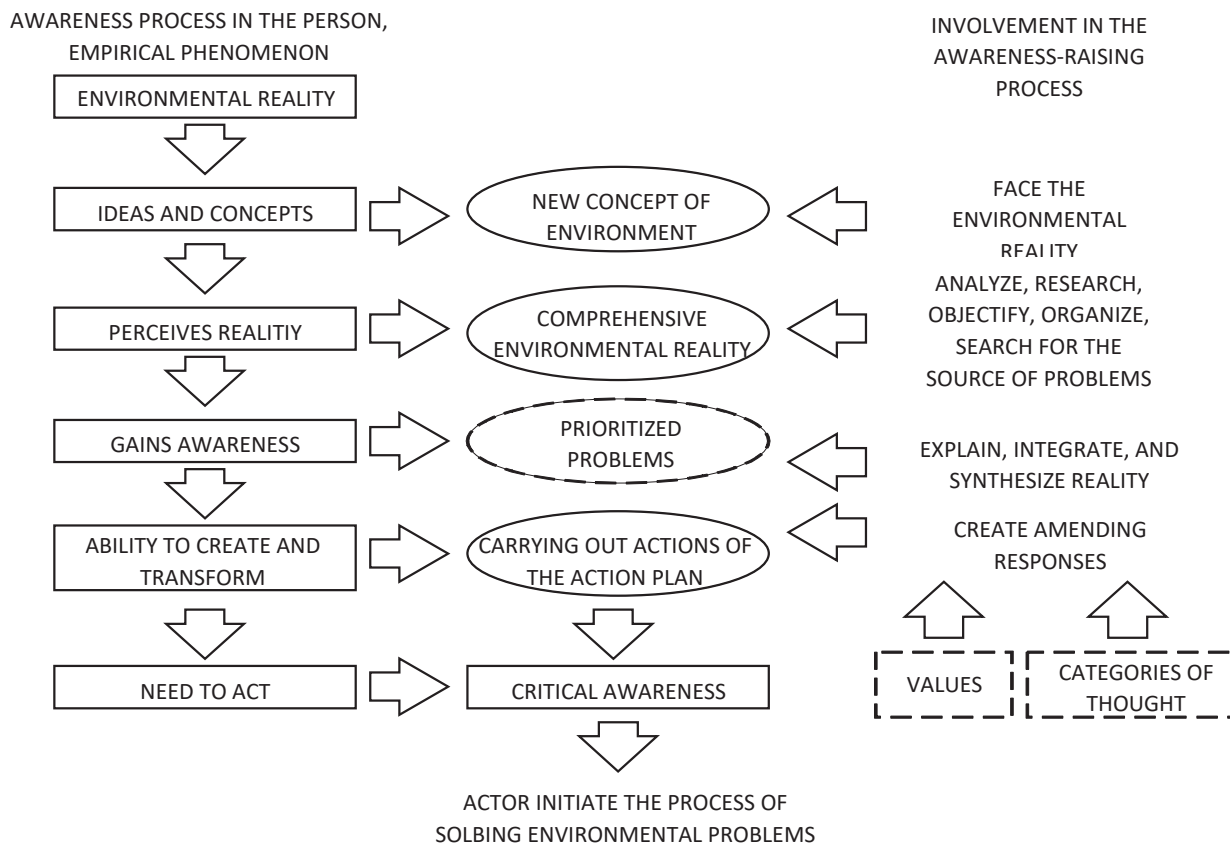


Figure 1. Environmental Awareness Model. Source: Chesney (2008).

Classification of Solid Waste by Nature

– Organic waste:

Waste of plant and animal origin that degrade naturally, produce gases, and dissolve as liquids in landfills.

– Inorganic waste:

Waste produced by human activities in mining and industrial areas, which do not decompose naturally and can be reused.

Relationship of Solid Waste to Health and the Environment

Household, industrial, and construction solid waste are related to health care and the environment that surrounds us.

Existen estudios sobre la relación entre el manejo de estos residuos con la salud; en la cual se han presentado situaciones principales: la transmisión de enfermedades bacterianas y parasitarias tanto por agentes patógenos transferidos por los residuos como por vectores que se alimentan y reproducen en los residuos; el riesgo de lesiones e infecciones ocasionados por su manipulación por los objetos punzo penetrantes que se encuentran en los residuos y la contaminación ocasionada por la quema de residuos, que afecta el sistema respiratorio de los involucrados [There are studies on the relationship between the management of solid waste and health, where the transmission of bacterial and parasitic diseases both by pathogens transferred by the waste and by organisms that feed on and reproduce in the waste have been observed. There is a risk of injuries and infections caused by handling the waste, sharp penetrating objects found in it, and contamination caused as a result of burning the waste, which affects the respiratory system of those involved]. (Contreras, 2008, cited in Abarca, Gutierrez, Escobar, & Huata, 2018, p. 316)

Solid Waste Collection and Transportation

Solid waste collection is carried out through various activities from the disposal of garbage from its origin, transportation and final location, which can be recycling sites and sanitary landfills (Jaramillo, 1999).

In 1997, the Pan American Health Organization stated that municipalities in Latin America and the Caribbean collected solid waste and took it directly

to landfills without carrying out any type of segregation that could provide economic benefits to the population (Acurio et al. 1997).

Municipal Solid Waste Management

The disposal of solid waste is the responsibility of the municipalities, conducted either by the institution itself or by a company contracted for this purpose. A responsible approach is required in order to take care of the environment and the health of the population in accordance with the solid waste laws of each country. Solid waste management in other countries can be taken as a reference, and it consists in generation, segregation at the source, storage, commercialization, collection, transportation, transfer, treatment, and final disposal.

Comprehensive Solid Waste Management

According to OEFA (2014), the comprehensive management of solid waste

es un conjunto de acciones normativas, financieras y de planeamiento que se aplica a todas las etapas de la gestión y manejo de residuos sólidos desde su generación, basándose en criterios sanitarios, ambientales y de viabilidad técnica y económica para la reducción en la fuente, aprovechamiento, tratamiento y disposición final de los residuos sólidos [is a set of regulatory, financial and planning actions applied to all stages of solid waste management and handling from its generation, based on sanitary, environmental and technical and economic feasibility criteria for the reduction at the source, use, treatment and final disposal of solid waste]. (p. 18)

OEFA (2014) also specifies that comprehensive solid waste management will be efficient as long as the aspects specific to each place are considered for it to be sustainable over time and benefit the inhabitants.

Management and Final Disposal Site of Solid Waste

Solid waste must be segregated and then transported to its final disposal site. Segregation is used to separate organic waste from inorganic waste and waste that can be reused; it is important to remember that solid waste management also includes the concept of treatment, which consists of waste recovery. To reduce and eliminate waste permanently, it is incinerated at the final disposal site (Jaramillo, 1999).

METHODOLOGY

This research is descriptive, because it analyzes the impact of implementing a work program on the level of awareness of the residents regarding the collection of solid waste.

An ex post facto or after-the-fact research design was used. In this type of design, the validation of the hypotheses is proposed after the study has been conducted. This type of design does not exercise control over the study variable.

The analysis of a control group and an experimental group is carried out in this research design, the scheme of which is presented below.

GE: X' 01

GC: - 02

Where:

X' : Implementation of the training and awareness-raising program

01 y 02: Observation of variables

EG: Experimental group

CG: Control group

The unit of analysis consisted of the family unit (household) in the San Carlos Neighborhood, Huancayo. The study population consisted of all the family units (households) in the San Carlos Neighborhood, Huancayo, approximately 5,000 households, that generate solid waste.

A probability sample was used in the research, because according to Hernández, Fernández and Baptista (2003)

todos los elementos de la población tienen la misma posibilidad de ser escogidos y se obtienen definiendo las características de la población y el tamaño de la muestra, y por medio de una selección aleatoria de las unidades de análisis [all the elements of the population have the same probability of being chosen and are obtained by defining the characteristics of the population and the sample size, and by means of a random selection of the units of analysis]. (p. 176)

As the population of analysis is finite and the total number of observation units that comprise it is known, the following formula was used:

$$n = \frac{Z^2 N \delta^2}{(N - 1)E^2 + Z^2 \delta^2}$$

Where Z is the 95% confidence level with a value of 1.96; δ^2 is the standard deviation of the per capita garbage generation of the population in the highlands with a value of 0.533 (kg/inhab/day); E is the permissible error with a value of 0.1; and N is the number of houses in the San Carlos Neighborhood according to the census of 2007 (Ipsos Perú, 2017), 4999 households, i.e. 25% of the total number of households in the province of Huancayo. From the calculations, 100 family units were obtained as the study sample to be interviewed and surveyed.

An interview was used as the data collection technique and the survey was used as the instrument, which was applied to a member of the family unit.

The survey was validated by eight experts. The content of the survey obtained a value of 0.9, which means that the judges approved of the questions asked. The construct reliability was also validated, where a high relationship between question and factors was obtained. In addition, the reliability or internal consistency was analyzed and a Cronbach's alpha equal to 0.894 was obtained.

The analysis is aimed at showing the correspondence between the research variables and describing the existing differences comparing each group, for which inferential analysis tools such as Mann-Whitney U were applied in order to validate the hypothesis and obtain the results shown below.

Table 1 shows the tools used for the analysis of the survey results.

RESULTS

The dependent variables used to test the hypotheses were:

DV1: Level of public awareness of recycling (Level of awareness).

DV2: Level of public awareness of recycling (Level of attitude towards household waste management).

DV3: Level of public awareness of recycling (Level of public sensitization).

Table 2 shows the survey questions for each of the variables presented above.

Table 1. Statistical Measurement Scale.

Variable	Indicator	Measurement Scale	Descriptive Statistics	Inferential Analysis
Level of public awareness of recycling	Likert scale: 1: Strongly disagree (SD). 2: Disagree (D). 3: Neither disagree nor agree (N) 4: Agree (A) 5: Strongly agree (SA).	Interval	Mean Standard deviation Variance Kolmogorov-Smirnov test	U de Mann-Whitney

Source: Prepared by the author.

Table 2. Survey Questions for the Dependent Variables.

Dependent Variable	Question
Level of public awareness of recycling (Level of awareness [AW])	Question 1: Do you consider the municipality's solid waste collection prevention and mitigation program to be optimal? Question 2: Is prevention the best alternative to avoid waste generation? Question 3: Is it important to sensitize, inform and raise awareness among citizens to prevent waste generation? Question 4: Will promoting prevention among the different sectors of the San Carlos neighborhood (schools, colleges, universities, buildings, industry and market) reduce the amount of waste generated?
Level of public awareness of recycling (Level of attitude towards household management [AT])	Question 5: Does the lack of environmental education and a waste management program cause families to litter? Question 6: If the municipality or a private party offered a training and awareness-raising program on preventive measures for the collection of household solid waste, would you attend? Question 7: Would proper garbage management improve the neighborhood environment? Question 8: Would you approve of an awareness campaign on the benefits of recycling? Question 9: Is the garbage collection plan scheduled by the Municipality adequate? Question 10: Would you approve that solid waste collection be managed by a private company? Question 11: Is there a need for an Environmental Management Department in Huancayo? Question 12: Does recycling represent an environmentally sustainable option for waste management in Huancayo?
Level of public awareness about recycling (Level of public sensitization) (SE)	Question 13: Do you think you are at risk of contracting diseases due to poor solid waste management? Question 14: Does the accumulation of solid waste in the streets attract informal recyclers, stray dogs, and rodents, posing a risk to public health? Question 15: Does uncollected garbage give the neighborhood a bad image?

Source: Prepared by the author.

Descriptive Analysis of the Control Group

Results of the descriptive statistical analysis of the control group are shown in Table 3. In this regard, it is observed that there is no deviation from the survey data; variation coefficients close to zero are also observed.

Normality Testing of the Control Group

Table 4 shows the normality analysis of the control group data. The *p*-values (asymptotic significance (2-tailed)) are less than alpha (0.05), indicating that the data do not follow a normal distribution.

Descriptive Analysis of the Experimental Group

For the analysis of the experimental group, the survey results were also analyzed using descriptive

statistics. In Table 5, standard deviations appear more clustered than in the case of the control group and coefficients of variation are closer to zero.

Normality Testing of the Experimental Group

The normality analysis performed on the data of the experimental group is shown in Table 6. The *p*-values (asymptotic significance (2-tailed)) are less than alpha (0.05), which indicates that the data do not follow a normal distribution.

HIPOTHESIS TESTING

Hypothesis testing was performed on the control group and the experimental group. The nonparametric Mann-Whitney U test for 2 independent samples

Table 3. Statistical Values of the Control Group.

Statistics		AW	AC	SE
N	Valid	100	100	100
	Missing	0	0	0
Mean		17.56	33.87	13.75
Median		18.00	34.00	15.00
Mode		20	32	15
Standard deviation		2.115	3.463	1.660
Variation coefficient		0.120	0.102	0.121
Variance		4.471	11.993	2.755
Skewness		-0.429	-0.277	-1.458
Kurtosis		-0.641	0.331	2.078
Range		8	16	7
Percentiles	25	16.00	32.00	13.00
	50	18.00	34.00	15.00
	75	20.00	36.00	15.00

Source: Prepared by the author.

Table 4. Normality Testing of the Control Group.

One-Sample Kolmogorov-Smirnov Test		AW	AC	SE
N		100	100	100
Normal parameters ^{a,b}	Mean	17.56	33.87	13.75
	Standard deviation	2.115	3.463	1.660
Most extreme differences	Absolute	0.176	0.095	0.294
	Positive	0.124	0.075	0.226
	Negative	-0.176	-0.095	-0.294
Test statistic		0.176	0.095	0.294
Asymptotic sig. (2-tailed)		0.000c	0.028c	0.000c

a. Test distribution is normal.

b. Calculated from data.

c. Lilliefors significance correction.

Source: Prepared by the author.

Table 5. Statistical Values of the Experimental Group.

Statistics		AW	AC	SE
N	Valid	100	100	100
	Missing	0	0	0
Mean		16.46	32.63	14.43
Median		16.00	32.00	15.00
Mode		16	32	15
Standard deviation		1.678	2.390	0.856
Variation coefficient		0.102	0.073	0.059
Variance		2.817	5.710	0.732
Skewness		0.705	0.441	-1.356
Kurtosis		-0.049	1.075	0.848
Rango		7	13	3
Percentiles	25	15.00	31.25	14.00
	50	16.00	32.00	15.00
	75	17.00	34.00	15.00

Source: Prepared by the author.

Table 6. Normality Testing of the Experimental Group.

One-Sample Kolmogorov-Smirnov Test		AW	AC	SE
N		100	100	100
Normal parameters ^{a,b}	Mean	16.46	32.63	14.43
	Standard deviation	1.678	2.390	0.856
Most extreme differences	Absolute	0.248	0.146	0.377
	Positive	0.248	0.128	0.253
	Negative	-0.112	-0.146	-0.377
Test statistic		0.248	0.146	0.377
Asymptotic sig. (2-tailed)		0.000c	0.000c	0.000c

a. Test distribution is normal.

b. Calculated from data.

c. Lilliefors significance correction.

Source: Prepared by the author.

was used to measure the influence between variables, because the data did not have a normal distribution.

Secondary Hypothesis 1

H₀: The implementation of a training and awareness-raising program on prevention and mitigation does not have a positive influence on the level of public awareness of recycling in the San Carlos Neighborhood - Huancayo.

H₁: The implementation of a training and awareness-raising program on prevention and mitigation has a positive influence on the level of public awareness of recycling in the San Carlos Neighborhood - Huancayo.

Table 7 shows the results of the Mann-Whitney U test for the level of awareness. A significance level of 0.000 < 0.05 was obtained; therefore, H₁ is accepted, which means that the implementation of a training and awareness-raising program on preventive measures has a positive influence on the level of public awareness of recycling.

Table 7. Mann-Whitney U Test Results for Level of Awareness.

Test Statistics	Level of Awareness
U de Mann-Whitney	3327.500
Wilcoxon W	8377.500
Z	-4.164
Asymptotic Sig. (2-tailed)	0.000

a. Grouping variable: Groups.

Source: Prepared by the author.

Secondary Hypothesis 2

H₀: The implementation of a training and awareness-raising program on handling and management measures does not have a positive influence on the level of public awareness of recycling in the San Carlos Neighborhood - Huancayo.

H₁: The implementation of a training and awareness-raising program on handling and management measures has a positive influence on the level of public awareness of recycling in the San Carlos Neighborhood - Huancayo.

Table 8 shows the results of the Mann-Whitney U test for the level of attitude towards household solid waste management. A significance level of 0.001 < 0.05 was obtained; therefore, H₁ is accepted, which means that the implementation of a training and awareness-raising program on handling and management measures has a positive influence on the level of public awareness of recycling.

Table 8. Mann-Whitney U Test Results for Level of Attitude towards Households Waste Management.

Test Statistics	Level of Attitude towards Household Waste Management
U de Mann-Whitney	3706.000
Wilcoxon W	8756.000
Z	-3.188
Asymptotic Sig. (2-tailed)	0.001

a. Grouping variable: Groups.

Source: Prepared by the author.

Secondary Hypothesis 3

H₀: The implementation of a training and awareness-raising program on health, hygiene and safety

protection measures does not have a positive influence on the level of public awareness of recycling in the San Carlos Neighborhood - Huancayo.

H₁: The implementation of a training and awareness-raising program on health, hygiene and safety protection measures has a positive influence on the level of public awareness of recycling in the San Carlos Neighborhood - Huancayo.

Table 9 shows the results of the Mann-Whitney U test for the level of public sensitization. A significance level of $0.008 < 0.05$ was obtained; therefore, H₁ is accepted, which means that the implementation of a training and awareness-raising program on health, hygiene and safety protection measures has a positive influence on the level of public awareness of recycling.

Table 9. Mann-Whitney U Test Results for Level of Public Sensitization.

Test Statistics	
	Level of Public Sensitization
U de Mann-Whitney	4025.500
Wilcoxon W	9075.500
Z	-2.658
Asymptotic Sig. (2-tailed)	0.008

a. Grouping variable: Groups.
Source: Prepared by the author.

DISCUSSION

Research results show the influence of the implementation of a training and awareness-raising program on the awareness of the population. In this regard, the results are consistent with those obtained by Santana (2012), who evaluated the recycling culture of a community of students and teachers after receiving training. In her opinion, it is important to train people at all levels to create a culture of care for the environment to minimize environmental damage in the world.

The implementation of training in handling and management measures has a positive influence on the level of public awareness of recycling in the San Carlos Neighborhood - Huancayo. According to Lopez (2014), community organizations play an important role in the implementation of training activities for the residents to salvage and use solid waste from the town square and the municipality. Promoting people's change through visual and physical information will be beneficial in changing the mentality about solid waste in the population;

this hypothesis was demonstrated by the non-parametric Mann-Whitney U test. People were trained in solid waste collection, segregation and sorting through the work program conducted, the results of which were verified in the survey of the experimental group. Estrada (2014) states that the characterization of household solid waste "*generaría empleo, disminución de la pobreza, ambiente amigable y lo mejor brindaría desarrollo sostenible en la población* [would create employment, reduce poverty, create a friendly environment and, best of all, provide sustainable development for the population]" (p. 23). Waste management measures should not only raise awareness among citizens, but also provide a monthly income to low-income families. Upon comparing the results with the research of Salgado and Salinas (2015), it is concurred that the inhabitants of different communities have not received a basic and solid education on the proper management of solid waste. It is necessary to further educate the population on solid waste in order to create knowledge and habits about the importance of good practices in the management and final disposal of household solid waste.

Similarly, López (2014) states that training and awareness-raising are important for solid waste management within the population and for a healthy environment; he also points out that solid waste management must be adjusted to the local reality because the country has a social complexity and idiosyncrasy that leads to poor handling and management of solid waste. Torres (2008) says that raising awareness among the entire community allows for the development of an efficient and adequate waste management system as a practical consequence. It is concluded that solid waste management is a technical and economic alternative that promotes the active participation of community members.

Las charlas de sensibilización son una excelente herramienta para mejorar la gestión de manejo de residuos sólidos (...). El estrato económico es un indicador importante al momento de seleccionar la muestra ya que influyo en la ejecución del proyecto y el aprendizaje de conceptos de los pobladores [Awareness lectures are an excellent tool to improve solid waste management (...). The economic stratum is an important indicator at the time of selecting the sample since it influenced the project execution and the villagers' concepts learning]. (Mamani, 2014, p, 89)

Consequently, it can be said that awareness-raising activities are very important in the handling and management of solid waste and that their implementation

is directly related to the socio-cultural stratum of the villagers.

The implementation of training and awareness-raising programs on health protection, hygiene and safety measures have a positive influence on the level of public awareness of recycling in the San Carlos Neighborhood - Huancayo. A comparison of the results with those of Velázquez (2006) shows that *“la solución para lograr una gestión sostenible de los residuos en cualquier gran ciudad no se basa exclusivamente en la inversión en tecnología, sino que las raíces fundamentales para obtener el éxito son de índole social, político y económico [the solution to achieve sustainable waste management in any large city is not based exclusively on investment in technology, but rather on social, political and economic factors]”* (p. 452). Solid waste management in developed European countries is thus understood to be a consequence of educating people about environmental care and health improvement. Training and awareness-raising measures will enable people to take care of their health, given that both organic and inorganic solid waste can cause damage. In this sense, the municipalities or institutions should carry out more training on health, hygiene and safety, because not all the inhabitants were trained in the project.

Training in prevention and mitigation has a positive influence on the level of public awareness of recycling in the San Carlos Neighborhood - Huancayo. The incorporation of knowledge and activities concerning the environment yielded great results in municipalities that have plans to educate the population and encourage the responsible treatment of solid waste (ESAP, 2016a). Awareness-raising should create a culture of prevention, control, minimization and repair of damage to the environment caused by solid waste among the population. The research coincides with that stated by Servicio de Gestión Ambiental de Trujillo [SEGAT] (2016), there is a direct relationship between solid waste segregation in households and lectures or educational materials on household solid waste management.

Based on the results obtained, training the population on the health impacts of inadequate solid waste management is important, so brochures and/or flyers with basic definitions and simple graphics should be used to conceptualize solid waste management in a clear and direct manner. The population should be made aware of the need to segregate waste in supply markets more frequently, because they are the main source of waste generation in cities, or economic incentive mechanisms should be established to reduce waste generation.

To summarize, the damage caused to the environment and health is a consequence of poor culture and the absence of environmental care plans (Espino & Rojas, 2018). It is necessary to propose training programs suited to the local reality to promote a healthy and balanced environment, which minimizes impacts and contributes to the care of rural and urban areas.

CONCLUSIONS

The implementation of a training and awareness-raising program on prevention and mitigation has a positive influence on the level of public awareness of recycling in the San Carlos Neighborhood, Huancayo. Evidence for this conclusion was provided by the non-parametric Mann-Whitney U test, which yielded a significance value equal to 0.000, that is, less than 0.05.

The implementation of a training and awareness-raising program on handling and management measures has a positive influence on the level of public awareness of recycling in the San Carlos Neighborhood, Huancayo. Evidence for this conclusion was provided by the non-parametric Mann-Whitney U test, which yielded a significance value equal to 0.001, that is, less than 0.05.

The implementation of a training and awareness-raising program on health, hygiene and safety protection measures has a favorable influence on the level of public awareness of recycling in the San Carlos Neighborhood, Huancayo. Evidence for this conclusion was provided by the non-parametric Mann-Whitney U test, which yielded a significance value of 0.008, that is, less than 0.05.

The training and awareness-raising activities on solid waste collection contributed to creating a culture of prevention among most of the participants.

Residents of the San Carlos Neighborhood believe that proper solid waste collection is important to avoid damaging public health.

Residents of the San Carlos Neighborhood believe that reducing the generation of solid waste through the recovery and use of the resources contained in solid waste is everyone's task.

Most of the population is in complete agreement that education on the segregation and collection of solid waste will help reduce the environmental problem.

Residents of the San Carlos Neighborhood believe that solid waste collection is a matter of national interest that will help take care of the environment.

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