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Artículo Científico

Acoustic pollution and its incidence in population health around bus station perimeter in Jipijapa city – Ecuador

Contaminación acústica y su incidencia en la salud de los habitantes en el perímetro de la terminal terrestre de la ciudad de Jipijapa – Ecuador

Poluição acústica e sua incidência na saúde da população em torno do perímetroda rodoviária na cidade de Jipijapa - Equador

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Abstract

This research entitled: " Acoustic pollution and its incidence in population health around bus station perimeter in Jipijapa city - Ecuador. " was carried out during 2017. The methodology used in this work was: observation prior determination of monitoring place, the application of survey, tabulation and interpretation of results. The monitoring was done during the two-month period. The monitoring was carried out on working days (Monday and Tuesday) and non-working (Sunday) at three key points of the perimeter of the bus station. Point 1 (front), point 2 (entry), point 3 (exit). After having monitored the noise pollution, the results were: The highest level of noise was presented in the month of June on Monday afternoon rush hours (12:30 pm to 1:00 pm) at point 1 (front side)) of the perimeter of the terrestrial terminal with a maximum monthly average of 79.8 decibels dB (A). The month of July presented a higher level of noise pollution in point 1, with a maximum monthly average of 79.9 decibels dB (A), these levels exceed the permissible limits that is 55 decibels dB (A) in a mixed commercial zone according to TULSMA. The main source that generates noise is the horn of rural and provincial buses, cars, motorcycles with defective exhaust pipes, motor vehicles in poor condition, among others. The possible damages caused by the exposure of noise pollution in inhabitants of this area with physiological and psychological effects are: headache, stress, irritability and aggressiveness, hearing loss, nervous system alterations. In addition, the respondents said they do not agree that drivers make unnecessary noises with the horn of their vehicles and agree that noise control standards should be applied; the noise that bothers most is generated by the buses. It also presents a proposal that contributes to finding solutions in noise pollution and its effects on the health of the inhabitants.

Keys words: Sound pollution, health, Jipijapa city.

Resumen

Esta investigación titulada: "Contaminación acústica y su incidencia en la salud de los habitantes en el perímetro de la terminal terrestre de la ciudad de Jipijapa – Ecuador" se realizó durante el periodo 2017. La metodología utilizada en este trabajo fue: observación previo a la determinación del lugar de monitoreo, la aplicación de encuesta, tabulación e interpretación de los resultados. El monitoreo se realizó durante el periodo de dos meses. El monitoreo fue realizado en días laborables (lunes y martes) y no laborable (domingo) en tres puntos clave del perímetro de la terminal terrestre. Punto 1 (parte frontal), punto 2 (entrada), punto 3 (salida). Después de haber realizado el monitoreo de la contaminación sonora, los resultados fueron: El mayor nivel de ruido se presentó en el mes de junio el día lunes en horas pico de la tarde (12H30 pm a 13H00 pm) en el punto 1 (parte frontal) del perímetro de la terminal terrestre con un promedio máximo mensual de 79,8 decibelios dB(A). El mes de julio se presentó un nivel más elevado de contaminación sonora en el punto 1, con un promedio máximo mensual de 79,9 decibelios dB (A), estos niveles sobrepasan los límites permisibles que es de 55 decibelios dB (A) en una zona comercial mixta según TULSMA. La principal fuente que genera ruido son los claxon de buses rurales y provinciales, de automóviles, motocicletas con tubos de escape defectuosos, motor de vehículos en mal estado, entre otros. Los posibles daños causados por la exposición de la contaminación sonora en los habitantes del perímetro de la terminal terrestre con efectos fisiológico y psicológico son: dolor de cabeza, estrés, irritabilidad y agresividad, pérdida auditiva, alteraciones al sistema nervioso. A demás los encuestados dijeron no estar de acuerdo que los conductores realicen ruidos innecesarios con el claxon de sus vehículos y están de acuerdo que se apliquen normas de control del ruido; el ruido que más molesta es el generado por los buses. También se presenta una propuesta que contribuya a buscar soluciones en la contaminación sonora y sus efectos en la salud de los habitantes.

Palabras claves: Contaminación sonora, salud, ciudad de Jipijapa

Introducción.

This research project refers to a study of "Acoustic pollution and its incidence in population health around bus station perimeter in Jipijapa city - Ecuador.". This is considered an environmental element of great importance that incurs in quality of life on people. Contamination by environmental noise is a direct unwanted consequence of the own activities that are developed, one of the main agents of noise pollution is produced in an anthropic way.

The term noise pollution refers to noise when it is considered as a pollutant, that is, an unwanted and annoying sound that can produce harmful physiological and psychological effects for a person or group of people. Noise, this builder is a physical contaminating phenomenon that can be perfectly measured and evaluated from an objective point of view (measurement of noise levels at different key points), field samples are taken, expressed in decibels; the most commonly used measurement equipment is the sound level meter. Sound pollution can alter the activities of users and inhabitants who are on the perimeter of the terminal during rest and relaxation hours, preventing concentration, and really more serious problems, creating states of fatigue and tension which can degenerate into nervous and cardiovascular diseases.

The bus station experiences noise pollution, since constant noise is tolerated because it is an establishment of daily activities where the means of transportation are parked and circulated, affecting the inhabitants who preside near this place. After having conducted the monitoring of noise pollution, the results were: The highest level of noise was presented in the month of June on a weekday in rush hours at noon on point 1 (front) of the terminal with a maximum average of 79.8 decibels dB (A). The month of July presented a higher level of noise pollution in point 1, with a monthly maximum of 79.9 decibels dB (A).

The perimeter of bus station corresponds to the mixed residential area that mainly comprises residential use, even thou commercial activities are presented and their level of sound pressure, expressed in decibels, may not exceed the permissible values of noise in the environment decreed in chapter VI, annex 5 of the Unified Text of Secondary Legislation of Environment Ministry (TULSMA), where according to the established zone the permissible limit of place observed is 55 decibels dB (A) according to the zone activities.

The purpose of this project is to study the noise pollution that exists in bus station perimeter of Jipijapa city, in relation to repercussions that may cause to inhabitants who are in this zone, this work consists of a objective and subjective analysis, it is also necessary to consider that there are no previous studies on this type of contamination, so this work will be support for future researches.

II. THEORETICAL FRAMEWORK

2.1 Noise pollution

As indicated (Peters, 2015). Noise pollution is defined as the presence in the environment of noise or vibration whatever the acoustic emitter that originates them, which imply discomfort, risk or harm to people, due to development of their activities or goods of any nature, originating significant effects on the environment.

2.1.1 Sources of noise pollution

As indicated ("Acoustic pollution", 2017) noise pollution can come from different sources such as:

Industrial activities: industrial activities, for example, mining, metal fabrication and transformation industries can cause great noise to the outside if proper preventive measures are not taken.

Transportation: road transport especially in cities and vehicles that are not only large trucks but cars, vans and motorcycles are also susceptible to generate a large amount of noise pollution but the most in centers of populations.

Construction: housing construction activities also generate a lot of noise due to transport of materials, cutting, etc.

Social habits: social habits are also one of the big problems of pollution in the cities: nocturnal social habits until late hours at night cause great annoyances in neighbors around the area who see their rest disturbed habitually.

As indicated (Acoustic Pollution, nd) Road traffic is the cause of a large percentage of noise in cities, occurs as a result of engine operation, transmissions and friction caused by the contact of the vehicle with the ground and the air.

The noisiest vehicles are buses followed by cars, and finally motorcycles. However, poor maintenance of some of the engines can change this circumstance. For example, a moped without a silencer is louder than a passenger car. In this aspect we must bear in mind that mopeds currently do not pass any technical inspection, which makes us dependent on the education and citizenship of its owner. Other elements with great importance in noise generation are the increase in number of vehicles that circulate road types, its conservation, and road layout.

The main energy contributions to environmental noise pollution would be approximately the following: Road transportation 80%, Industrial activities 10%, Rail traffic 4%, Other (air traffic, public works .etc) .. 6%. The noise produced by aircraft is a serious environmental problem that affects the urban centers located near airports. The level of noise caused by a jet plane during the landing phase, measured 2km from the runway, can exceed 115dB, a level of intensity that is annoying and even painful for some people.

2.2 Physiological and psychological effects on inhabitant's health

They are detrimental effects on behavior, mental and physical health of people, when the stimulus exceeds certain limits and even if this level is much lower the noise produces discomfort and hinders or impedes attention, communication, concentration, rest and the dream, as shown (La contaminacion Acustica, 2008) Prolonged exposure to a source of noise can cause deafness, or even perforations in the eardrum. In addition to ear injuries, noise pollution has other consequences that particularly affect the cardiovascular, respiratory and digestive systems.

2.2.1 Physiological effects

Hearing effects. - Exposure to intense noise levels, leads to hearing loss, which if initially recoverable when the noise ceases, can eventually become irreversible becoming deaf. This deafness is perceptual and symmetrical, which means that it affects both ears with the same intensity.

Non-auditory effects. - The noise also acts negatively on other parts of the organism, where it has been proven that 50 to 60 decibels dB (A) are enough to create diseases associated with sound stimulus. In presence of noise, the organism adopts a defensive posture and makes use of its protection mechanisms. Between 95 and 105 decibels dB (A) the following conditions occur:

irrigation in brain, alterations of central nerve system, alterations in digestive process, colic and intestinal disorders, increase in muscle tension and blood pressure , pulse changes in the encephalogram, among these we cite sleep, memory, attention and information processing.

2.2.2 Psychological effects

Effects on sleep. - Noise can cause difficulties to fall asleep and also awaken those who are already asleep. The dream is the activity that occupies a third of our lives and this allows us among other things to rest, order and project our conscious. It has been proven that sounds of 60 decibels dB (A) reduce the depth of sleep.

Effects on behavior. - The sudden appearance of a noise can produce alterations in behavior that, at least momentarily, can be made more abject, or more aggressive, or the person could show a greater degree of disinterest or irritability.

Effects on memory. - In tasks where memory is used, a better performance is observed in subjects who have not been subjected to noise. With this level of noise the person activity grows and this, in principle can be advantageous, in relation to performance in certain types of tasks, it turns out that what it produces is an overactivation that leads to a decrease in performance.

Effects on attention. - Noise affects the attention, focusing on the most important aspects of the task, in detriment of those other aspects considered less relevant.

Effects on pregnancy. - It has been observed that pregnant mothers who have been from the beginning in a very noisy area, have children who do not suffer alterations, but if they have installed in these places after 5 months of gestation (the ear becomes functional), after childbirth the children cannot stand the noise, they cry whenever they feel it, and at birth their size is lower than normal.

Effects on children. - As noted (Vidal Carmen, p1, 2008) Noise is a risk factor for children´s health and has a negative impact on their learning. Children educated in a noisy environment make them less attentive to acoustic signals, and suffer disturbances in their ability to listen and a delay in learning to read. It hinders verbal communication, favoring isolation, low sociability and also increases the risk of suffering stress.

2.2.3 Sound pollution and health

As mentioned (Ecodes, 2005) A lot of scientists and experts dealing with the subject, and numerous official bodies including the WHO, the EEC, the German Federal Environment Agency and the Spanish CSIC (Higher Council for Scientific Research), They have unanimously stated that noise has very harmful effects on health. These damages range from purely physiological disorders, such as the known progressive loss of hearing, to psychological ones, producing an irritation and fatigue that cause dysfunctions in daily life, both in work performance and in relationship with others. The list of possible consequences of noise pollution is long: interference in communication, sleep disturbance, stress, irritability, decreased performance and concentration, aggressiveness, fatigue, headache, stomach problems, blood pressure alteration, heart rate disorder, immune system depression, altered levels of endocrine segregation, vasoconstriction, mental problems, depressive states, etc.

III. METHODOLOGY

Research Geographical Location

The present research work was carried out in the bus station perimeter of Jipijapa city, located in the southwest side of the province of Manabí, between the following coordinates:

West Length 80º 25` and 80º 52`

South Latitude 1º10`and 1º47` (25)

Concerning the southern area of the province of Manabí, it is made up of the cantons of Jipijapa, Paján and Puerto López and 24 de Mayo. They occupy 3,441.49 km2 of surface, which corresponds to 15.65% of the province of Manabí. Its economy is basically based on agricultural production subject to the inclemency or kindness of nature, exploitation of artisanal fishing and a nascent impulse of tourism. The Cantonal Header of Jipijapa has 44,870 inhabitants. The bus station perimeter belongs to the rural parish of San Lorenzo de Jipijapa which universe of 18,026 inhabitants was used, taking into account 391 individuals, obtained from the sample size of the area.

We can observe the movement coming from the activities that are generated in the terminal, such as circulation and taxis parking, urban and provincial buses, on the other hand, we can see traffic of light vehicles and heavy loads coming from other places not necessarily typical of the action generated in this establishment, which usually cause noise.

The present investigation was developed by observation method prior to determining location and application of measurement, tabulation and interpretation of results.

The descriptive method was also used because it is aimed to determine the levels of noise pollution and health effects on inhabitants of the studied area which was carried out in a period of two months, June and July, on working days (Monday and Tuesday) and non-working days (Sunday). The monitoring was carried out in three key points: Point 1 (front part), point 2 (entrance), point 3 (exit) of bus station in Jipiyapa city. The measurement was made in a period of ten minutes for each key point, completing in the three points where the measurements were taken a total period of half an hour; in each section of the schedule in rush hours, in the morning from 7:30 a.m. to 8:00 a.m., in the midday hours from 12:30 a.m. to 1:00 p.m. and in the afternoon from 5:30 p.m. to 6:00 p.m.

To determine sound pressure levels, a Larson Davis Sound Track Integral LxT1 s / n: 0003067 Type 2 Integrating Sound Level Meter was used. Adjusted in weighting with A scale and Slow Response. Also, the sound level meter was placed at 1.10 m. of the ground and 1 to 1.5 m, far from the facade of the houses or enclosures.

In order to determine the main Physiological and Psychological effects because of noise pollution, surveys were carried out on people related to this problem within the study area.

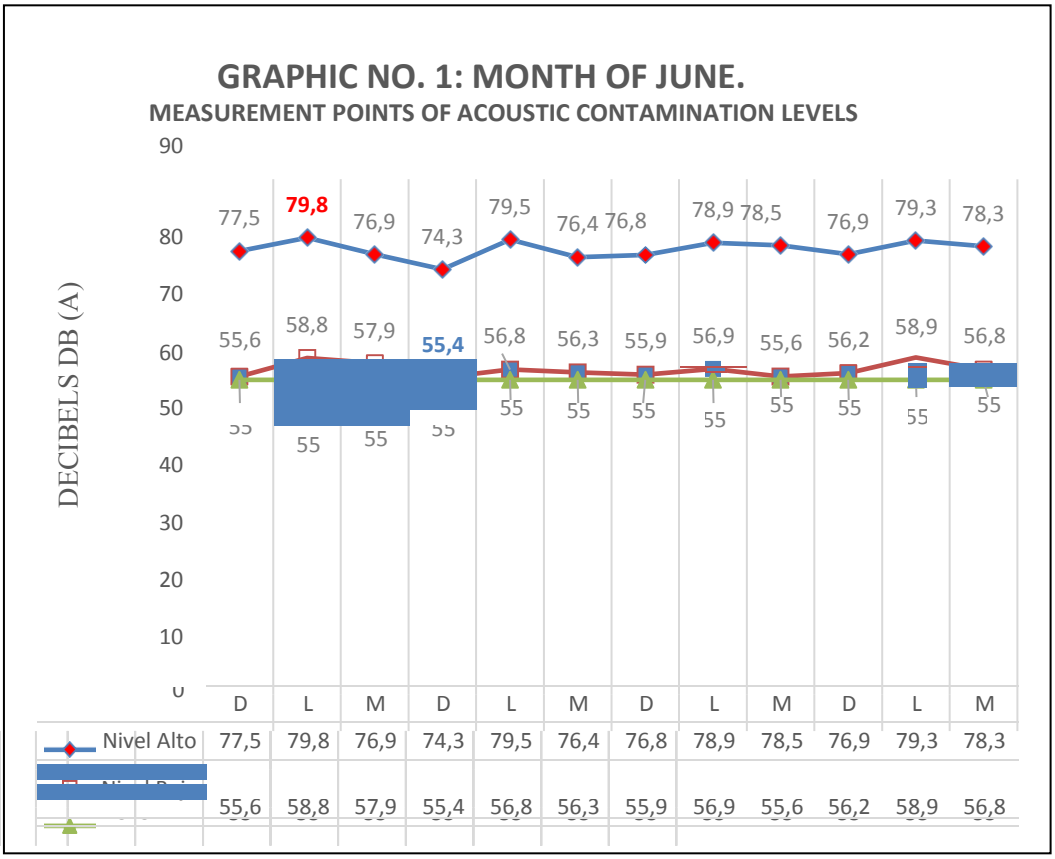
IV. RESULTS

Table N ° 1: Results in "decibels" for the month of June.

Daily averages of measurements in working days and non-working days (rush hours)				
Place	**Days**	**High level**	**Low level**	**TULSMA**
Bus Station Perimeter	Sunday 4	77,5	55,6	55
	Monday 5	**79,8**	58,8	55
	Tuesday 6	76,9	57,9	55
	Sunday 11	74,3	**55,4**	55
	Monday2	79,5	56,8	55
	Tuesday 13	76,4	56,3	55
	Sunday 18	76,8	55,9	55
	Monday 19	78,9	56,9	55
	Tuesday 20	78,5	55,6	55
	Sunday 25	76,9	56,2	55
	Monday 26	79,3	58,9	55
	Tuesday 27	78,3	56,8	55

Source: Own Elaboration

Graphic No. 1: Month of June.



Source: Own Elaboration

Analysis and interpretation of results

According to data obtained on table and graph N ° 1 it was observed that the first Monday of June on rush hours of noon from 12:30 a.m. - 1:00 p.m. at point 1, the daily average of highest level was 79.8 decibels dB (A), this value being higher than the allowable in Ecuador, recommended by the TULSMA that is 55 decibels dB (A), it should be noted that the influence of noise was produced by the circulation of light and heavy vehicles, other sources of noise was the unnecessary use of horn caused by both urban and provincial buses and motorcycles; However, on the second Sunday at point 3 in the afternoon from 5:30 p.m.-6: 00 p.m, the daily average of the lowest level perceived was 55.4 decibels dB (A).

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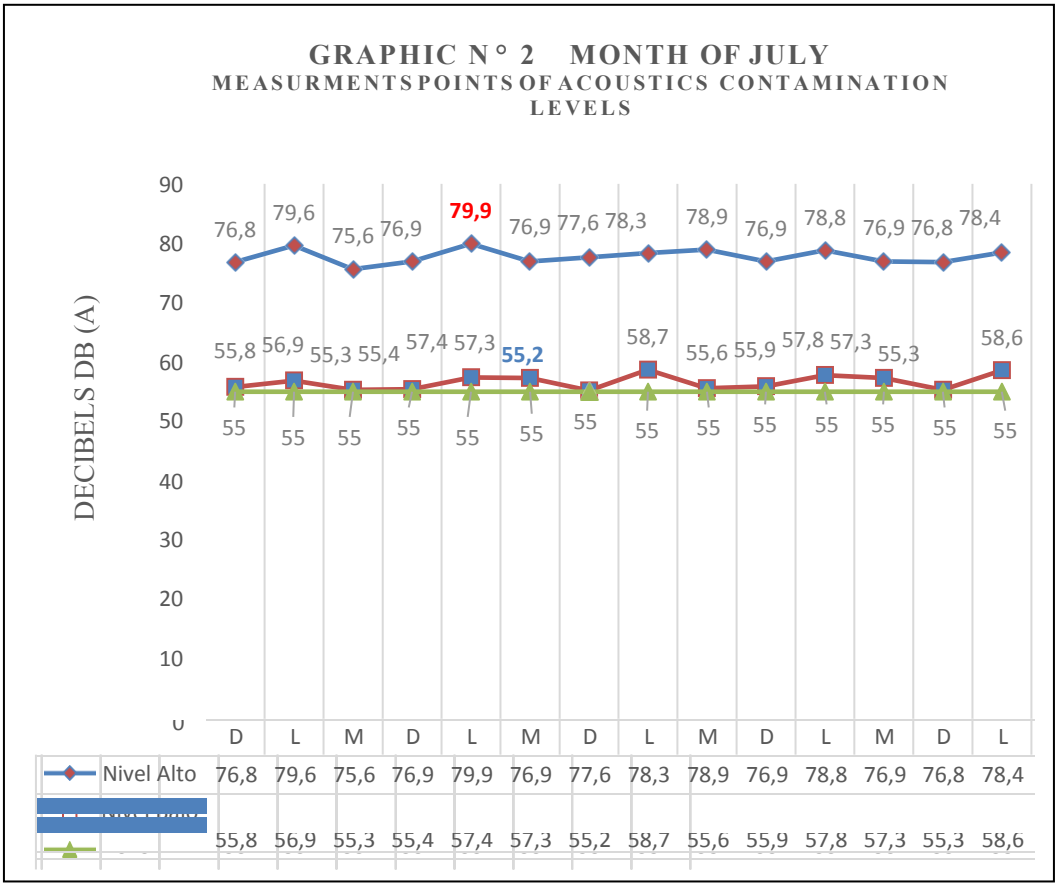
Table No. 2: Results in "decibels" for the month of July.

Daily averages of measurements in working days and non-working days (rush hours)				
Place	**Days**	**High level**	**Low level**	**TULSMA**
Bus Station Perimeter	Sunday 2	76,8	55,8	55
	Monday 3	79,6	56,9	55
	Tuesday 4	75,6	55,3	55
	Sunday 9	76,9	55,4	55
	Monday 10	**79,9**	57,4	55
	Tuesday 11	76,9	57,3	55
	Sunday 16	77,6	**55,2**	55
	Monday 17	78,3	58,7	55
	Tuesday 18	78,9	55,6	55
	Sunday 23	76,9	55,9	55
	Monday 24	78,8	57,8	55
	Tuesday 25	76,9	57,3	55

Source: Own Elaboration

Graphic No. 2: Month of July.



Source: Own Elaboration

Analysis and interpretation of results for the month of July

Once the results were analyzed and interpreted according to table and graph No. 2, it was perceived that the second Monday of July in point 1 at noon from 12H30-13H00 it could be seen that daily average of the highest level was 79.9 decibels dB (A), this value being higher than the allowable in Ecuador, recommended by the TULSMA that is 55 dB (A), it is worth mentioning that the influence of noise was caused by the congested circulation of light and heavy vehicles, other sources of noise was the improper use of the horn caused by both urban and provincial buses and

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motorcycles; However, the third Sunday in point 3 in the afternoon from 5:30 pm to 6:00 pm, the daily average of the lowest level of noise pollution was 55.2 decibels dB (A).

Survey directed to the inhabitants of bus station perimeter in Jipijapa city.

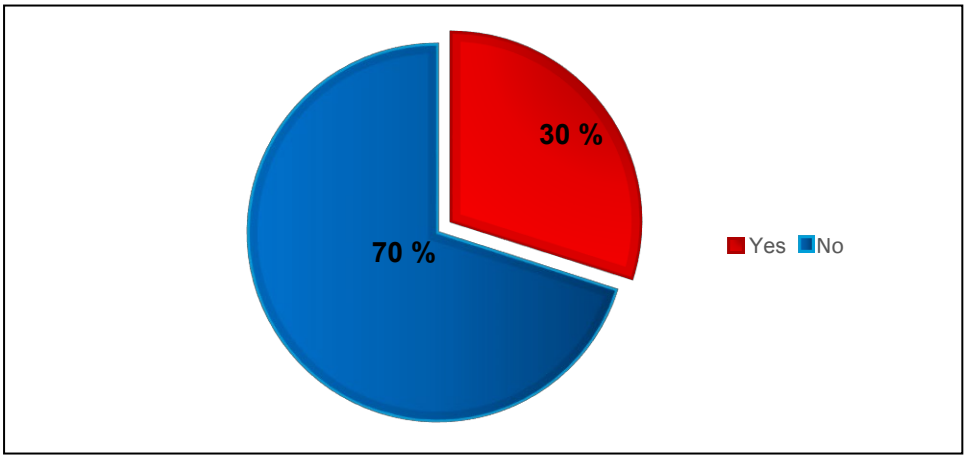
1.- Do you know what sound pollution is?

Table N° 3: Do you know what sound pollution is?

Options	Frecuency	Percentage
Yes	117	30%
No	274	70%
Total	391	100%

Source: Own Elaboration

Graphic N° 3: ***Do you know what sound pollution is?***



Source: Own Elaboration

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Analysis and interpretation

According to data obtained on table and graph table and graph N ° 3, 70% of surveyed said they do not know what noise pollution is, while 30% answered they have knowledge about it. According to these results we have that most of the surveyed have no clue about what noise pollution is.

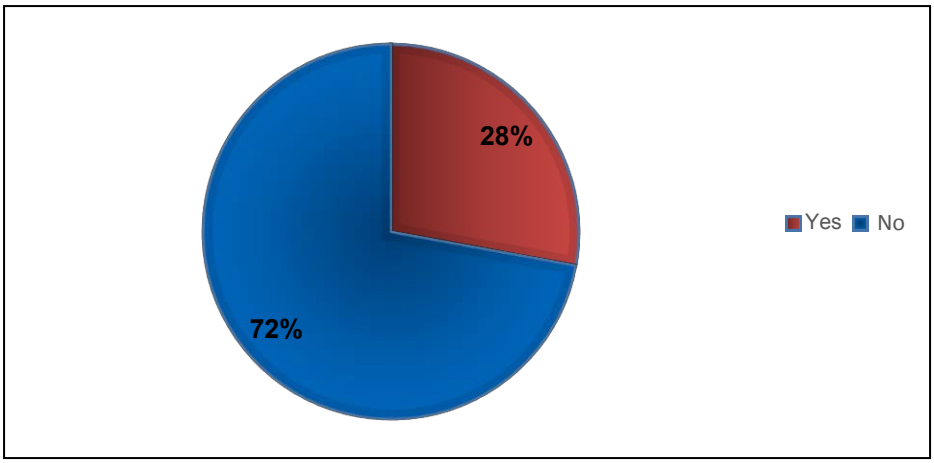
2.- Do you know how sound pollution occurs?

Table N° 4: Do you know how sound pollution occurs?

Options	Frecuency	Percentage
Yes	109	28%
No	282	72%
Total	391	100%

Source: Own Elaboration

Graphic N° 4: ***Do you know how sound pollution occurs?***



Source: Own Elaboration

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Analysis and interpretation

According to data obtained on table and graph table N ° 4 and graph N ° 4, the great mayority of surveyed do not know how noise pollution occurs with a percentage of 72%; However, 28% of them said they know how noise pollution occurs. According to this analysis we can see that most of people do not know how noise pollution occurs.

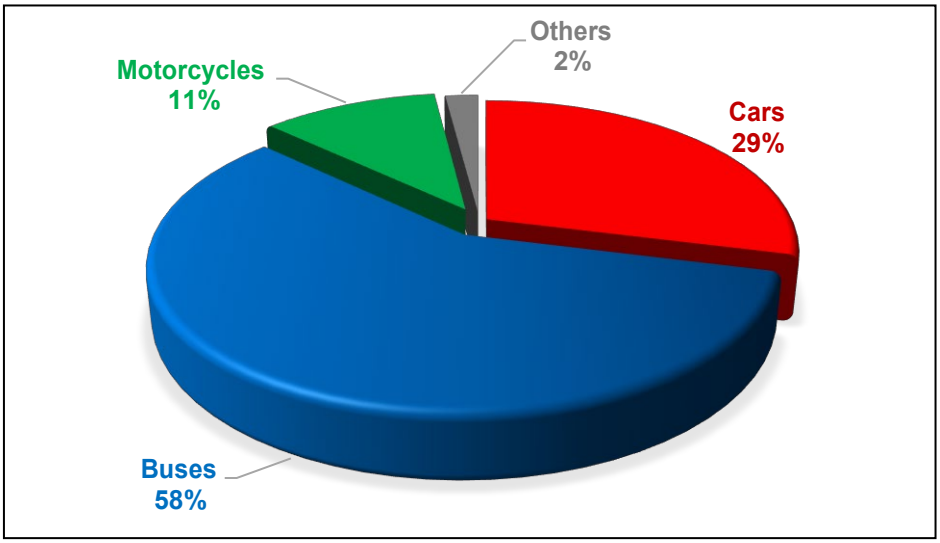
3.- According to you, what would be the source that causes more noise near the bus station area in Jipijapa city?

Table N° 5: What would be the source that causes more noise?

Options	Frecuency	Percentage
Buses	227	58%
Cars	113	29%
Motorcycles	43	11%
Others	8	2%
Total	391	100%

Source: Own Elaboration

Graphic N° 5: ***What would be the source that causes more noise?***



Source: Own Elaboration

Analysis and interpretation

According to data obtained on table and graph table and graph N ° 5, 58% of people mostly believe that buses produced the biggest discomfort because of their noise; while 29% answered that it is produced by automobiles, 11% answered that it is produced by motorcycles, while only 2% think it is produced by other sources. According to the results obtained, buses produce the mayor noise pollution.

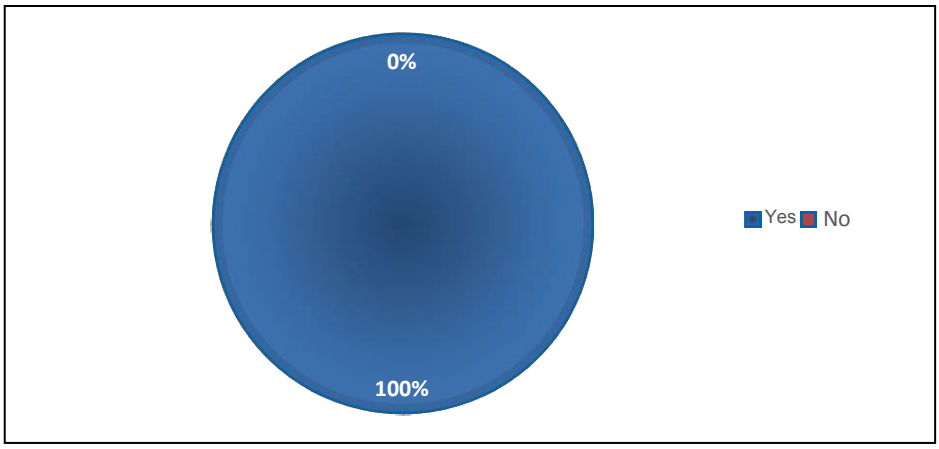
4.- Do you think there is noise pollution at the bus station in Jipijapa city?

Table N° 6: Do you think there is noise pollution at the bus station in Jipijapa city?

Options	Frecuency	Percentage
Yes	391	100%
No	0	0%
Total	391	100%

Source: Own Elaboration

Graphic N° 6: **Do you think there is noise pollution at the bus station in Jipijapa city?**



Source: Own Elaboration

Analysis and interpretation

Once analyzed and interpreted table and graph N ° 6, 100% of surveyed agreed there is noise pollution around bus station area.

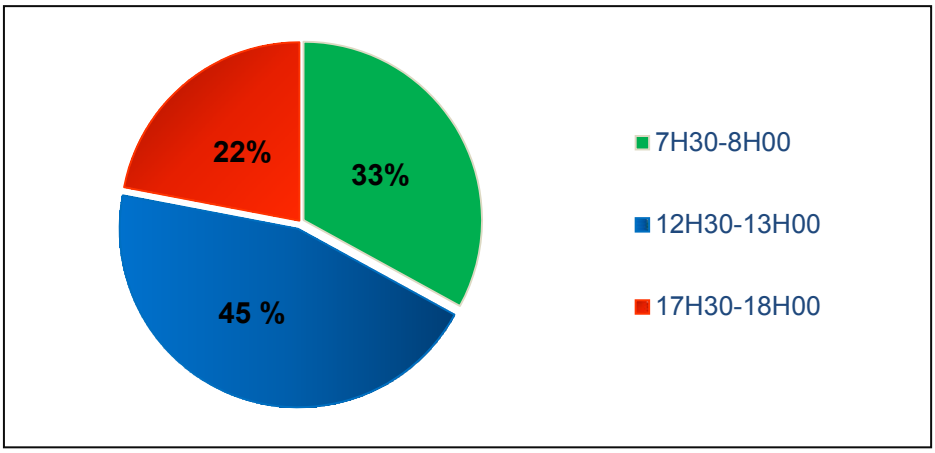
5. - At what time noise pollution occurs more frequently?

Table N° 7: At what time noise pollution occurs more frequently?

Options	Frecuency	Percentage
07H30-08H00	129	33%
12H30-13H00	176	45%
17H30-18H00	86	22%
Total	391	100%

Source: Own Elaboration

Graphic N° 7: **At what time noise pollution occurs more frequently?**



Source: Own Elaboration

Analysis and interpretation

According to data obtained and expressed in table and graph N ° 7, 45% of surveyed agreed the lapse during the day there is most noise pollution is noon (12H30-13H00); 33% answered it is

during the morning (07H30-08H00) and 22% during (18H00-19H00). According to this analysis, the majority of noise is perceived at noon. (12H30-13H00).

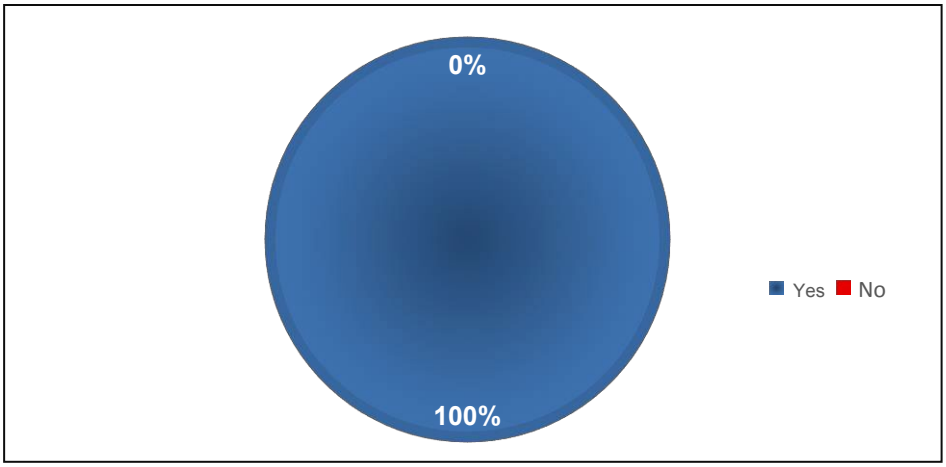
6. - Do you consider that noise could become a problem for people health around bus station area of Jipijapa city?

Table N° 8: Do you consider that noise could become a problem for people health around bus station area of Jipijapa city?

Options	Frecuency	Percentaje
Yes	391	100%
No	0	0%
Total	391	100%

Source: Own Elaboration

Graphic N° 8: ***Do you consider that noise could become a problem for people health around bus station area of Jipijapa city?***



Source: Own Elaboration

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Analysis and interpretation

Once analyzed and interpreted table and graph N ° 8, all of surveyed considered that noise could be harmed for people health.

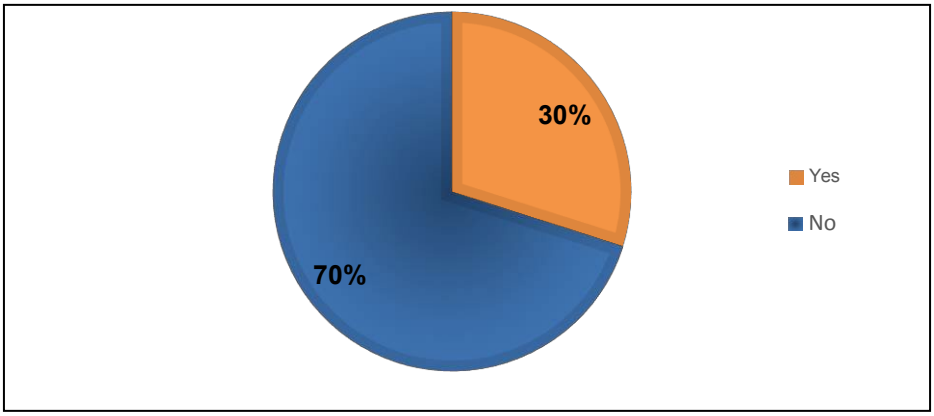
7. - Do you know the main physiological and psychological effects in health caused by sound pollution?.

Table N° 9: Do you know the main physiological and psychological effects in health caused by sound pollution?.

Options	Frecuency	Percentage
Yes	117	30%
No	274	70%
Total	391	100%

Source: Own Elaboration

Graphic N° 9: Do you know the main physiological and psychological effects in health caused by sound pollution?.



Source: Own Elaboration

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Analysis and interpretation

According to data obtained on table and graph table and graph N ° 9 70% of surveyed people answered they do not know what the main physiological and psychological effects caused by noise pollution in the health are, however, a 30% of them said they know about these effects. According to this analysis, we can state that majority does not have knowledge about the physiological and psychological effects caused by noise pollution.

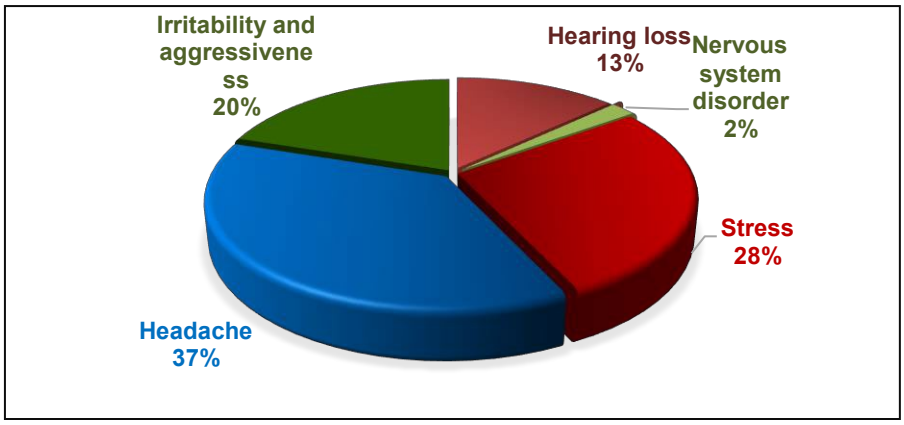
8.- What could be the possible damages caused by the exposure of noise pollution in this area?

Table N° 10: What could be the possible damages caused by the exposure of noise pollution in this area?

Options	Frecuency	Percentage
Irritability and aggressiveness	51	13%
Nervous system disorder	8	2%
Stress	109	28%
Headache	145	37%
Hearing loss	78	20%
Total	391	100%

Source: Own Elaboration

Graphic N° 10: **What could be the possible damages caused by the exposure of noise pollution in this area?**



Source: Own Elaboration

Analysis and interpretation

According to data obtained on table and graph table and graph N ° 10, 37% of people surveyed agreed that headache is the principal health problem caused by noise pollution, followed by strees where 28% of people think this is the main consecuence in health caused by noise pollution, 20% believe that would cause irritability and aggressiveness, 13% hearing loss, while 2% said that it causes alterations to the nervous system. According to these results, the majority answered that the main effects of sound pollution on health is headaches.

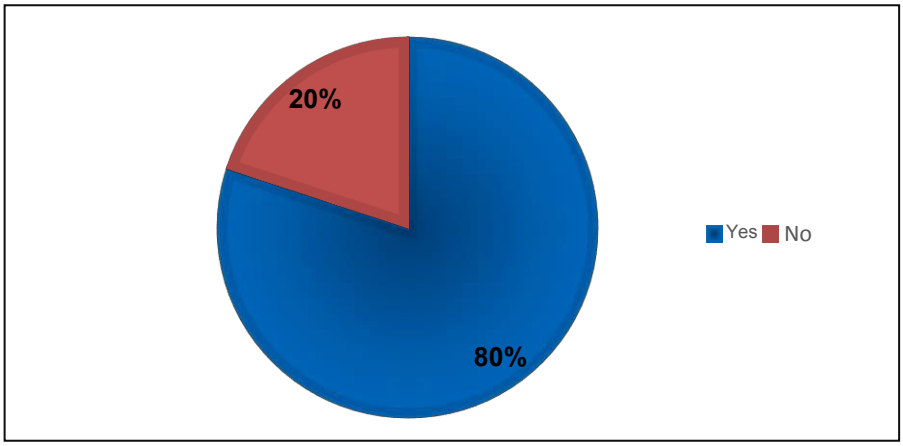
9.- If environmental education workshops on noise pollution were held, would you attend?

Table N° 11:- If environmental education workshops on noise pollution were held, would you attend?

Options	Frecuency	Percentage
Yes	313	80%
No	78	20%
Total	391	100%

Source: Own Elaboration

Graphic 11: **If environmental education workshops on noise pollution were held, would you attend?**



Source: Own Elaboration

Analysis and interpretation

Once table and graph No. 11 were analyzed and interpreted, 80% of people stated that they would attend environmental education workshops on noise in Jipijapa; however, 20% of them answered that they would not attend these environmental education workshops. According to the results obtained, most agree to attend environmental education workshops.

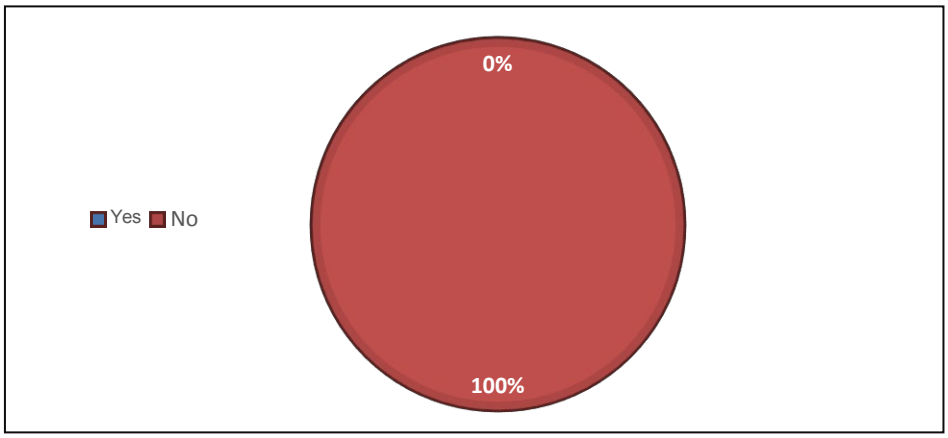
10.- Do you know that there are controls by the Autonomous Decentralized Government (GAD) of Jipijapa city for prevention and punishment of noise pollution?

Table N° 12: Do you know that exist some rules and control by government on noise pollution?

Options	Frecuency	Percentage
Yes	0	0%
No	391	100%
Total	391	100%

Source: Own Elaboration

Graphic N° 12: **Do you know that exist some rules and control by government on noise pollution?**



Source: Own Elaboration

Analysis and interpretation

Once table and graph N ° 12 were analyzed and interpreted, surveyed in their entirety do not have knowledge about controls by the decentralized autonomous government (GAD) of Jipijapa city for prevention and sanction on noise pollution.

V. Conclusions.

- An evaluation and monitoring process was carried out during rush hours (07h30-08h00 am), (12h30-13h00 pm), (17h30-18h00 pm), in working days (Monday and Tuesday) and non-working (Sunday) , where reliable results were obtained with samples taken at three key points P1 (Front) P2 (Entrance), P3 (exit), giving a considerable noise pollution where the daily average of the highest level was 79 , 8 decibels dB (A) in P1 (front) from 12:30 a.m. to 1:00 p.m., which is displayed in June. In the month of July the highest level of noise pollution is perceived with a monthly maximum daily average of 79.9 decibels dB (A) in P1 (front), where light and heavy vehicles circulate in the afternoon being this hours the most congested. The results obtained exceed the environmental regulations stipulated in chapter V, annex 5 of the TULSMA, the permissible limits of noise levels in environment that is 55 decibels dB (A) in the mixed commercial zone, it is concluded that a monitoring system of noise levels is needed to ensure compliance with current regulations and, in turn, to carry out controls on the activities of people (s) traveling in their vehicles or transports that generate noise disturbance.

- It was determined by means of surveys the possible damages caused by the exposure of acoustic contamination with physiological psychological effects such as headache, stress, irritability and aggressiveness, hearing loss and alterations to the nervous system. The environmental impact caused by noise is high, because it exceeds 70 decibels dB (A), which have harmful effects such as possible hearing loss, continuous headaches that alter health on the population. It should also be noted that most residents around bus station area of Jipijapa

city are unaware of noise pollution and in turn mentioned in their majority that time when most noise is perceived is during midday from 12H30 to 13:00 pm.

- A proposal was elaborated that contributes to mitigate the acoustic contamination and its incidence in population health, to end, it is suggested that conduct environmental education trainings about noise pollution and its consecuence on health is needed, it will serve as knowledge so people in their vehicles do not generate unnecessary noise and apply the current norms.

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VII. Bibliografia.

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