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COVID-19 AND SOUNDSCAPE CHANGES DUE TO THE LOCKDOWN. THE CASE OF LIMA, PERU

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***Abstract**: The COVID-19 pandemic has changed the way of life of the world's population, and initially all non-essential commercial and industrial activities in all countries were suspended, as well as the temporary closure of major airports and educational activities. As never before, environmental sound levels were reduced as a result of the quarantine, as the authorities ordered people to remain confined in their homes in order to reduce and prevent the SARS-CoV-2 transmission. Cities became silent and in some cases birds and wildlife "took over" this situation. This change in the soundscape led to sounds that were previously masked, now being heard, i.e. HVAC and other noises. This article presents the case of Lima, Peru, in which the impact and annoyance produced by aircrafts overflights are analyzed (during 2020); as well as the healthy soundscape levels achieved 'thanks' to the commercial lockdown and leisure activities.*

***Keywords:** soundscape, COVID-19, noise monitoring, statistics, annoyance, mental health*

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1. INTRODUCTION

The emergence and rapid spread of the "Severe acute respiratory syndrome coronavirus 2" (SARS-CoV-2) around the world surprised everyone equally, and the Authorities of each country were forced to impose different public health measures to prevent contagion. The immediate international airports' shutdown was the first action taken, and to prevent the mobility of people and to ensure quarantine, the temporary closure of all non-essential activities and a ban vehicles circulation in streets, was decisive for a radical change in the soundscape perception, because the amount of background noise in cities dropped substantially, as well as the modification of other environmental factors (air quality, particulate matter reduction, etc.).

The COVID-19 outbreak came along and changed everything, including vibration levels as a result of no vehicular traffic circulation, as demonstrated by the records of network sensors installed around the world [1], but more important was the urban sound levels hug reduction, but not the noise levels in buildings, i.e., anthropogenic noise moved from the outside to the inside.

One purpose of this article is to introduce the discussion about the future of acoustics, in the sense that even if the pandemic is beaten, the "new normal" will be different from the "old normal" and, architectural design will change under the new concepts of preventing future pandemic contagions, and that it will also be a challenge for acoustic engineering, since now ventilation systems will be more powerful (meaning more noise and more vibration) because they will have to use sophisticated filtering systems to avoid air contaminated re-circulation.

This article analyzes the modification of the soundscape, mainly produced by airplanes noise in Magdalena del Mar, one of the 43 Lima's districts, and will mention a few cases of noise nuisance generated inside houses that, because of the confinement people had to live 24/7 with their families (every home became office, gym, school, etc.) but also with their neighbors. To this article three well distinguishable time periods are selected:

- Period 1: From March 1st to March 15, 2020, before the inception of the lockdown due to COVID-19.
- Period 2: From March 16 to June 30, 2020, covering the first lockdown to the opening of non-essential activities.
- Period 3: From July 1st to December 31st, 2020, covering the first opening of non-essential activities to a new lockdown in 2021 New Year's Eve.

2. LOCATION OF THE SOUND MONITORING STATION

Magdalena del Mar has been impacted by airplane noise for the last 12 years, changing the subjective soundscape perception by people of several residential Lima's neighborhoods. The airplane noise is annoying in night hours, but more disturbing at dawn because the early morning flights from Lima to Peruvian provinces are many.

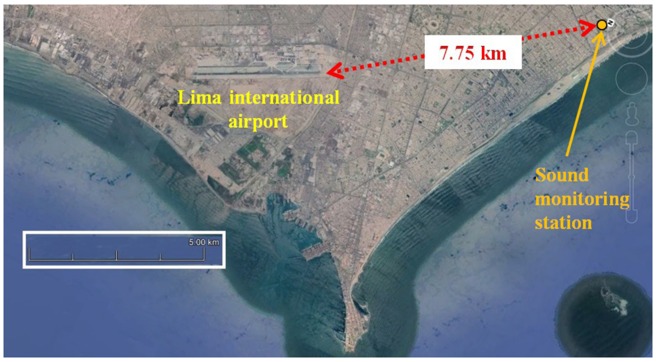

Fig. 1: Sound monitoring station location relative to Lima airport

Fig. 1 shows the relative position of the sound monitoring station during Period 1 (12°05'32.40"S - 77°03'55.45"O) at 7.75 km from Jorge Chavez Lima international airport departure point. Due to the change of the soundscape perception in Magdalena, the authors decided to install a TA120 noise sensor to know the environmental sound levels, it means, this is not an airplane noise survey.

The noise monitoring station is installed on a fourth-floor rooftop of the building office, which is near to the aircraft climbing curve towards to the ocean that leave Lima, this spot is in the middle of a block far away from any noisy avenues or streets, and this location is important because of the city background noise is low enough to measure the airplanes passing-by noises.

3. MATERIALS AND METHODS

This chapter includes all technical information, metrics, and old concepts applied new way to improve the existing methods, which will be used in the article.

3.1. Sound monitoring station description

The monitoring station that has been used is a TA120 Noise measuring sensor for Smart Solutions made by CESVA® (Barcelona, Spain) the instrument compliance and fulfill a Class 1 sound level meter characteristics, as defined in IEC 61672-1:2013 [2], and according to a Third party APPLUS(+) EN ISO/IEC 17025 Accredited laboratory, the company which have done the normalized procedures. The TA120 model used for this monitoring record:

- The sound level each second and transmits from Peru, one L_{Aeq} value every minute to a NoisePlatform® cloud located in Barcelona (to access the data from anywhere). The data was acceded and downloaded in Argentina (in Excel® format), which the spreadsheet contains the time--stamp and the L_{Aeq} for each minute.
- The L_{Aeq}, and does not register the L_{ASmax}, according to ISO 20906:2009 this is 'the most appropriate indicators for airplane noise measurements' [3].

3.2. Sound levels metrics

The TA20 monitoring station uses the A-weighting curve defined in ISO 61672-1:2013 [3]; formula 1 shows the *equivalent continuous sound pressure level* (ECSPL) as defined in ISO 1996-1:2016 [4] also, then for a generic interval T of time through from t_1 to t_2 and the p_0 reference pressure is 20µPa:

$$L_{\mathrm{Aeq},T} = 10\lg \frac{\frac{1}{T}\int_{t_1}^{t_2} p_{\mathrm{A}}^2(t)\mathrm{d}t}{p_0^2}\ \mathrm{dB} \tag{1}$$

To correlate the results with others countries (mainly Europeans), the day-evening-night L_{den} noise indicator as is defined in Directive 2002/49/EC [5] and ISO 1996-1:2016 [4], the formula 2 is used. The reference hours are: L_D or L_{Day}, from 06.00 h to 18.00 h (12 hours); L_E or $L_{Evening}$, from 18.00 h to 22.00 h (4 hours), L_N or L_{Night} from 22.00 h to 06.00 h (8 hours).

$$L_{den} = 10 * lg\frac{1}{24}\left(12 * 10^{\frac{L_{day}}{10}} + 4 * 10^{\frac{L_{evening}+5}{10}} + 8 * 10^{\frac{L_{night}+10}{10}}\right)\mathrm{dBA} \tag{2}$$

3.3. Sound descriptor based on statistical functions

To processes the data some macros and procedures were written into Visual basic for applications (VBA) computer language, in order to use the large Excel® functions library, such us: Percentile, logarithmic, deviation, average, normal distribution, variance, etc. The sound descriptors used in this article are the following:

- Percentile sound level, being the N percent exceedance level during the time interval T, symbolized as $L_{N',T}$ [4]; for this article two percentiles are used: The 10th (L_{10} or $L_{10,T}$) and the 90th (L_{90} or $L_{90',T}$)
- The noise climate sound level is defined as the difference between the 10th percentile and the 90th percentile levels, symbolized as '(L_{10}–L_{90})'
- Range sound level, the maximum L_{Aeq} sound level (symbolized as L_{Amax}) and the minimum L_{Aeq} sound level (symbolized as L_{Amin}), both are based on an integral time T=1 minute [4]. The difference between the L_{Amax} and L_{Amin} values is the range

3.4. Noise climate sound descriptor

The noise climate sound descriptor has been used for decades, also it was applied as a part of another sound descriptor named *Traffic noise index* (TNI), which was introduced in England in 1968 [6], but the *noise climate* is not a normalized sound descriptor yet.

According to Manojkumar et al, "*Noise climate is useful for analyzing the variation of sound levels in a given time period*" [7]; but the noise climate is been used as a plausible soundscape descriptor according to Herranz-Pascual et al, "*The perception of acoustic comfort is related to acoustic indices, with $L_{Aeq',T}$, L_{10} and L_{50} being the most relevant, while the pleasantness of a soundscape is associated to L_{10}–L_{90}*" [8], and "*This result may be due to the stronger relationship of soundscape with the L_{10}–L_{90} parameter, which also reflects fluctuations in the sound environment as well as being related to the number of events;*" to understand what the noise climate value means: "*Higher noise climate indicates high fluctuation of sound level for a given time period, which causes more annoyance*" [9].

A paper by Ascencio et al, presents a taxonomy proposal for the assessment of the changes in soundscape resulting from the COVID-19 lockdown [10], and they also suggest using the L_{10} and L_{90} as an "*extended indicators*" because they represent emergence and noise variation indicators: "***Emergence: Difference between the source event and the overall background level*** (L_{10}–L_{90})" [10].

3.5. Soundscape concept

In this article the term *soundscape* is used to describe a subjective acoustic environment perception as defined by the Canadian composer and acoustician Murray Schafer in 1970s: "*psychoacoustic concept in which a soundscape is an acoustic environment as perceived and analyzed by humans*" [11], and it is not used like ISO metric [12].

4. PERIOD 1: SOUND LEVELS BEFORE THE CONFINEMENT ORDER BY PERUVIAN GOVERNMENT

February 2020 had a different urban soundscape because is summer in Peru, so the sound level analysis of Period 1 starts on March 1st until March 15, 2020, before the confinement order, so this interval time considers all airplanes flights under normal condition. In Fig. 2 the evolution of ECSPL, with integral time T=1 hour symbolized as $L_{Aeq,1h}$, during these days are shown, where each day is separated by a light-blue dashed line.

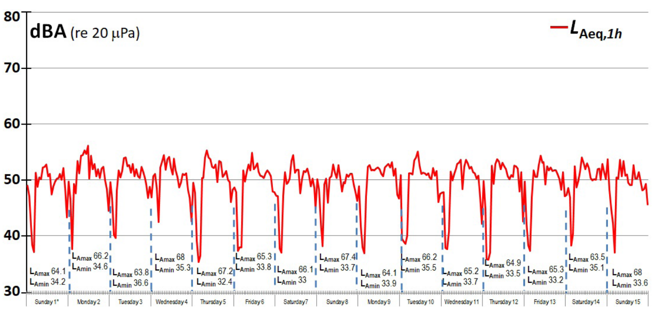

Fig. 2: $L_{Aeq,1h}$ evolution before confinement order. From March 1st to 15, 2020

In Fig. 2 the L_{Amax} and L_{Amin} for each day are highlighted to know the daily sound level range, and it is possible to see that the lowest levels are achieved among 02.30 h and 04.30 h.

5. PERIOD 2: SOUND LEVELS DURING THE FIRST LOCKDOWN AND CONFINEMENT ORDER

The Peruvian government decreed the State of National Emergency on March 16, 2020, which included quarantine, confinement, social distancing, closing down the nonessential activities, and inasmuch airport lockdown for commercial services after which only few humanitarian flights were allowed. Because people had reacted in dissimilar ways to COVID-19 outbreak, the government imposed several Phases to prevent social interactions in Lima and the rest of Peru.

5.1. Stage 1: Sound levels after the State of National Emergency order

Noise levels in days following the State of National Emergency were irregular, since the suspension of certain activities was gradual (only the essential ones were maintained), and the Lima airport was operating only with humanitarian and exceptional flights, either for the return of foreigners to their countries or for the return of Peruvians who were abroad. In Fig. 3 the evolution of the hourly ECSPL from March 16 until March 28, 2020, are shown, where each day is separated by a light-blue dashed line.

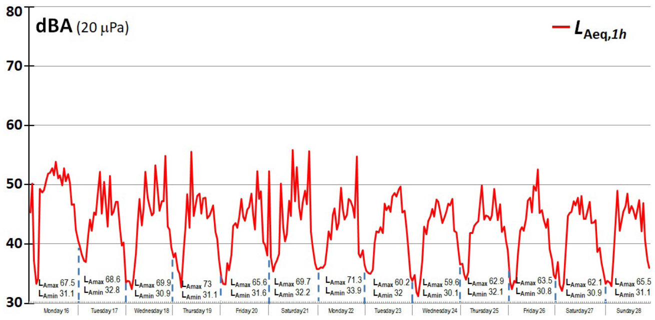

Fig. 3: $L_{Aeq',1h}$ evolution after confinement order. From March 16 to 28, 2020

5.2. Stage 2: Sound levels during a strict curfew order by Peruvian government

Despite the confinement order, people didn't care about the COVID-19 outbreak the government imposed a ban on circulation in Lima streets from March 29 to April 5, 2020.

The soundscape was real quiet in this Stage, because there were no buses on the streets and no people after 18.00 h outsides their homes, so the environmental sound levels reached the lowest ones. Fig. 4 shows the $L_{Aeq,1h}$ evolution of those atypical days, and it was allowed only a few special flights services.

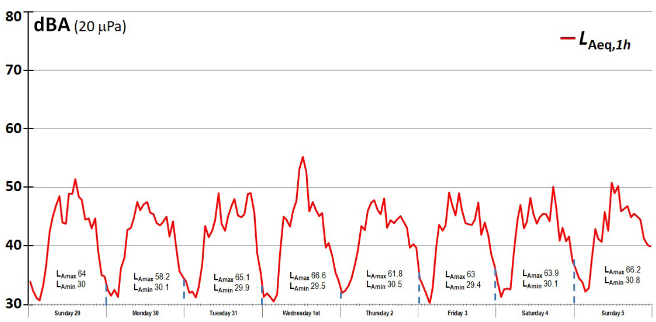

Fig. 4: $L_{Aeq,1h}$ evolution during a strict curfew. From March 29 to April 5, 2020

5.3. Stage 3: Sound levels before "first opening" under curfew order

To know the sound levels before the "first opening," the authors analyze the week from May 3 to 9, 2020, as a special case (see Fig. 5 the $L_{Aeq,1h}$ evolution) because since May 11 another governmental Phase took place.

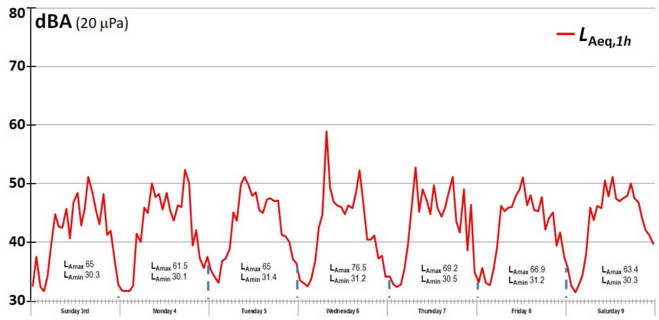

Fig. 5: $L_{Aeq,1h}$ evolution during a strict curfew. From May 3 to 9, 2020

During this week the social distancing was strict, therefore people were allowed to move through 08:00 h to 18:00 h, only to carry out essential activities and buy groceries; it allowed some humanitarian and specific commercials flights in Lima International Airport.

5.4. Stage 4: The last month in confinement before the opening on July 1st

Throughout the June lockdown people had to stay at their homes more time for two reasons: **(a)** a strict curfew after 20.00 h, **(b)** it was winter season, consequently the urban noise levels produced by this social interaction were atypical. Fig. 6 shows the $L_{Aeq'1h}$ evolution in June 2020, where the sound levels were as low as never before imagined, and the soundscape perception was truly an "acoustic tranquility time" as can be seen in Fig. 6. The maximum sound level (among these days) was 73.8 dBA and the lowest sound level was 29.1 dBA.

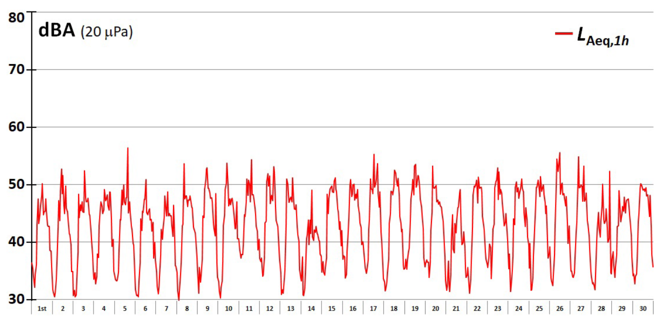

Fig. 6: $L_{Aeq,1h}$ evolution. Last month before the opening. From June 1st to 30, 2020

6. PERIOD 3: SOUNDSCAPE AFTER THE ECONOMIC OPENING ON JULY 1ST, 2020

As a consequence of economic factors (the other pandemic as consequence of COVID-19), the authors' office had to move out to another location but within the same District of Magdalena del Mar, and the new spot location is now at 280 m away from the previous one, nevertheless the sound monitoring was continued. Given the complexity of trying to make a direct comparison among the sound levels obtained on different measurements points, a separate analysis of the records being obtained at this new location will be carried out as of July 1st, and it is identified as Period 3.

An important fact to highlight on the part of the authorities is that they imposed a ban circulation of buses and inasmuch public transportation on Sundays, to ensure social distancing and reduce the possibility of people meetings; this governmental decision was beneficial for the environment because the urban sound was kept very low during morning hours.

Although the opening of the economic reactivation began on July 1st, the "new normal" reveals itself in a change in the soundscape perception from Monday, July 6, 2020. Monday, November 2nd, 2020, was the day when the Lima international airport was opened only for commercial flights (not for tourism).

6.1. Lima soundscape from July 5 to October 31st, 2020

The soundscape after the "abnormal" opening on July 1st, 2020, was really atypical because the opening didn't include all activities such as face-to-face education and leisure events, building construction activities started gradually, public passenger transport services were been increased as the number of people authorized to travel on the street increased, and the authorities in some days had to backtrack on decisions by imposing momentary restrictions on the people movements, in order to ensure adequate social distancing among people.

As a result of the above, therefore, the sound levels variance and their range are large, so analyzing isolated data within this time interval would not provide information that could be correlated with, for example, a long-term statistical trend.

Fig. 7 a comparison between the $L_{Aeq,1min}$ evolution –with integral time T=1 minute– of the first week (light-blue colored curve) and the last week (red colored curve) of the economic opening period are shown, where is possible to observe how the noise levels of the last week (red line) are higher, due to the fact that after 120 days of "opening" for the economic reactivation, automobile traffic have gradually increased, accompanying the more people mobility and the gradual reduction of their confinement.

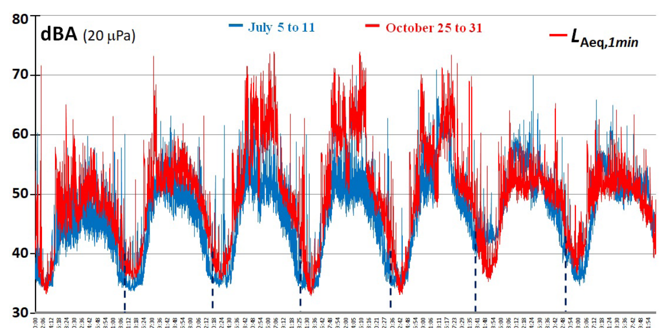

Fig. 7: Comparison between the first and the last week of the opening, 2020

6.2. Lima soundscape after the airport opening up to December 31st,2020

On November 2nd, 2020, the Lima international airport has been full opened to commercial flights (internationals and nationals) but not for tourism proposes. Fig. 8 shows the $L_{Aeq'1h}$ time history during two months (November and December 2020), where one can observe a kind of "erratic" sound levels behavior due to its high variance (the range is 36.2 dBA), but this is a consequence of:

- The low number of buses and the restriction of automobile traffic in streets.
- There are no on-site educational activities.

- People had to return home before 20.00 h.
- A curfew was imposed from 20.00 h onwards.
- No bus traffic in the streets on Sundays.

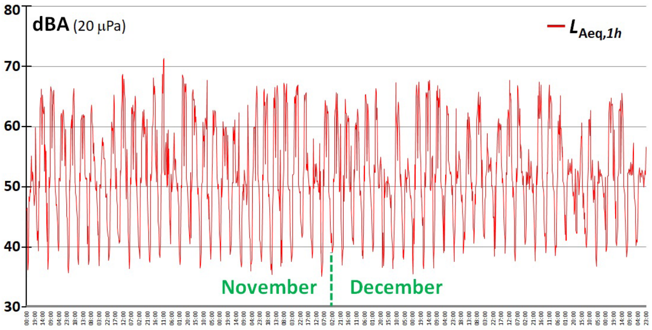

Fig. 8: $L_{Aeq,1h}$ evolution of November through December, 2020

7. SOUNDSCAPE ANALYSIS FROM MARCH 1ST UP TO JUNE 30TH, 2020

This article presents the sound levels results and its analysis considering the Lden noise indicator, because there is no Peruvian legal mention of using any [13]. The time-windows analyzed here (into periods and stages), in some cases overlaps the Peruvian Public Health Phases or those as it has been suggested by WHO [14], this is because the goal of this article is to analyze the anthropogenic noise behavior and how it affected the soundscape.

To correlate the results with others countries, as it was mentioned above, in Tab. 1 the L_D, L_E, L_N values and the L_{den} by formula 2, are summarized.

Period/Stage	L_D	L_E	L_N	L_{den}
Period 1: March 1st to 15, 2020	52.0	51.0	47.7	55.3
Period 2 – Stage 1: March 16 to 28, 2020	46.7	44.3	35.6	47.0
Period 2 – Stage 2: March 29 to April 5, 2020	46.7	44.3	35.6	47.0
Period 2 – Stage 3: May 3 to 9, 2020	48.3	44.2	37.1	48.1
Period 2 – Stage 4: June, 2020	48.5	44.3	36.2	48.0

Tab. 1: Summary of sound levels by means of L_{den} noise indicator (dB re 20 μPa)

In Tab. 1 is possible to observe the following:

- During the strict curfew the L_N were 8 dBA less than before the lockdown.
- During strict quarantine and curfew, the daytime L_D sound level was reduced by 5.3 dBA and the nighttime L_N sound level was reduced by 12 dBA.
- In the different opening scenarios, the daytime L_D sound level was reduced by 3 dBA and the nighttime L_N by 11 dBA on average.
- The afternoon L_E sound level in all scenarios was reduced by almost 7 dBA, compared with the L_E before the lockdown.
- The afternoon and nighttime sound levels in the different scenarios (after the lockdown) are almost the same, as a result of the prohibition of vehicle and human traffic between 18:00 and 06:00.
- The last month (in June) before the opening, the L_N was 11 dBA less than before the lockdown, because there were no airplanes overflights and the ban on circulation in streets due to the curfew order.

This survey shows how high the noise levels produced by overflying aircraft during nighttime hours correlate with the psychological annoyance they produce, mainly in the early hours of the morning. As an example of the airplane noise impact in Magdalena del Mar, in Fig. 9 a comparison between a March nights (before the lockdown) against a June one (during lockdown and curfew) is shown, were the time history for the latest night flights and the earliest morning flights (before the lockdown) are highlighted.

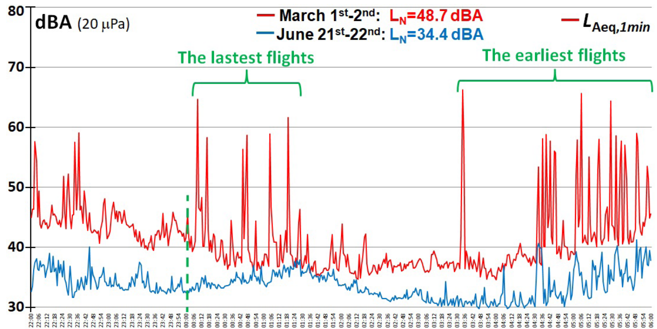

Fig. 9: $L_{Aeq,1m}$ time-history of two nights before/during lockdown, 2020

Fig. 9 shows the time-history of two nights: From March 1st 22.00 h to March 2nd 06.59 h (red curve), with a L_N = 48.7 dBA; from June 21st 22.00 h to June 22th 06.59 h (light-blue curve), with a L_N = 34.4 dBA. The influence of airplane noise for the latest night flights are high, but for the earliest morning flights at dawn (from 04.30 h to 06.00 h) are higher, the equivalent sound level $L_{Aeq,2.5h}$ had increased by 52.5 dBA. The soundscape change is huge and because of the elimination of aircraft overflights during the lockdown: The nighttime sound level L_N was reduced by 14.3 dBA.

8. SOUNDSCAPE ANALYSIS OF JULY AND DECEMBER 2020

Since the measurements at this point started on July 1st, therefore there is no knowledge of the sound levels during the Phases prior to that date. The measurements result will be compared in two contexts as follows:

- First week after the opening, on July 5th, 2020, with the Lima airport under lockdown.
- Last week of December 2020, with the Lima airport fully functional only for commercial flights (for turism is not allowed yet).

Tab. 2 summarizes the day-evening-night sound levels for each of the above mentioned contexts.

Period 3	L_D	L_E	L_N	L_{den}
One July week from 5th to 11th	55.3	48.7	42.5	52.7
One December week from 25th to 31st	58.4	51.7	47.2	55.9
Difference	+3.1	+3.0	+4.8	+3.1

Tab. 2: Sound levels comparison among two weeks of Period 3 by means of L_{den} noise indicator (dB re 20μPa)

It is observed in Tab. 2 that the average increase of L_D and L_E sound levels is greater than 3 dBA, and during night the L_N sound levels rise up to 4.8 dBA, all of these as a result of aircraft overflights that depart from Lima's international airport toward to the ocean to leave Lima City.

9. ENHANCING AND IMPROVING THE SOUNDSCAPE ANALYSIS

One goal of this article is to use objective values by means of statistical tools, to provide some right sound descriptors to analyze the changes in the soundscape, due to COVID-related sound levels reductions. Attempting to study the sound levels' behavior by means of time-averaged values do not offer much guarantee of having solid arguments to describe a soundscape.

9.1. Soundscape analysis by means of long-term sound levels behavior

Observing a long-term graph can give a visual idea of the long-term sound levels´ behavior, because a priori a statistical trend can be seen, as shown in Fig. 10, which shows the time history of the L_D (red curve), L_E (blue curve) and L_N (light-blue curve) sound levels of Period 1 and Period 2, i.e., the values recorded at the first TA120 noise sensor location.

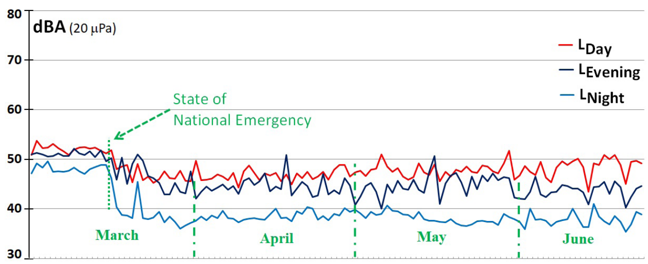

Fig. 10: L_D, L_E, L_N time-history from March 1st to June 30th, 2020

In Fig. 10 is easy to observe how the L_N nighttime sound levels dropped abruptly around an average of 12 dBA after the lockdown order, because of there was no passing-by airplane flights in nighttime, after the State of national emergency inception on March 16th, 2020.

9.2. Soundscape analysis using the noise climate descriptor

To see the noise climate as a "physical descriptive power" [10], Fig. 11 shows the hourly noise climate evolution ($L_{10,1h}$–$L_{90,1h}$) between two days (the same ones presented in Fig. 9), where it is possible to make a comparison of noise climate sound descriptor: Before the lockdown with airplanes flights (red line, March 1st–2nd), and during lockdown with no flights (Blue line, June 21st–22nd).

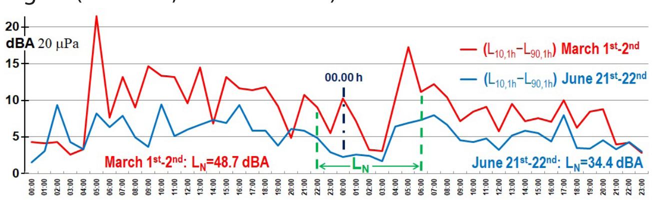

Fig. 11: Noise climate ($L_{10,1h}$–$L_{90,1h}$) comparison: Before/during lockdown, 2020

It is interesting to observe in Fig. 11 (the x-axis are enlarged), that the noise climate evolution shows a better idea of the soundscape perception, because it is a "*good description of the energetic increase produced by a source*" [10]. It also shows the time-window with flights at dawn hours in which the noise climate value is higher than 12 dBA, and inasmuch the noise climate values before the lockdown were higher, and early in the morning on March 1st the noise climate reached 21.5 dBA, which correlates with the psychological annoyance expressed by the people who live in Magdalena del Mar because this urban area is below the aircraft climbing curve towards to the ocean that leave Lima.

9.3. Soundscape analysis by means of percentile sound levels and statistical trend

The act of analyzing the sound levels by means of Lden, allows acousticians to have three values for each day, so it is interesting using the percentile levels of each period, to improve the examination. Due to the sound levels high variance (σ2), the authors have used the percentile levels time-history (see Fig. 12) in order to observe the fluctuation of the long-term sound levels evolution.

Tab. 3 summarizes the L_D, L_E, L_N of two days (just as an example) and the L_{10}, L_{90} for each day-evening-night individually during Period 3: The day with the lowest sound levels (July 5) and another day with the highest sound levels (November 16), which took place within Period 3, between July and December. The use of percentile level of L_D, L_E, L_N was proposed by the authors in JASA paper [15], but for this article they have been selected them as follows:

- The $L_{10'D}$ is the 10th percentile level for day hours (between 06.00 to 18.00 h).
- The $L_{90'N}$ is the 90th percentile level for night hours (between 22.00 to 06.00 h).

Day (Period 3)	L_D	$L_{10,D}$	$L_{90,D}$	L_E	$L_{10,E}$	$L_{90,E}$	L_N	$L_{10,N}$	$L_{90,N}$
Sunday, July 5	47.4	50.0	42.6	46.5	49.4	40.6	41.5	40.9	34.7
Friday, November 16	65.9	64.4	52.9	50.3	53.9	48.4	44.4	47.6	39.2

Tab. 3: Day-evening-night sound levels and their percentiles values for two days (dB re 20 µPa)

Fig. 12 shows the time history only for $L_{10,D}$ (blue curve) and $L_{90,N}$ (red curve). In a comparison between $L_{10,D}$ against $L_{90,N}$ it is interesting to observe that the $L_{90,N}$ evolution gives a better idea of how the "background" sound levels are increasing slowly. On the other hand, the $L_{10,D}$ evolution is better for showing the impact noise because of the anthropogenic sound produced by people's movement due to de-escalation. Another interesting thing to note is how $L_{10,D}$ level leaps down regularly, and that occurred only on Sundays, because street circulation was forbidden.

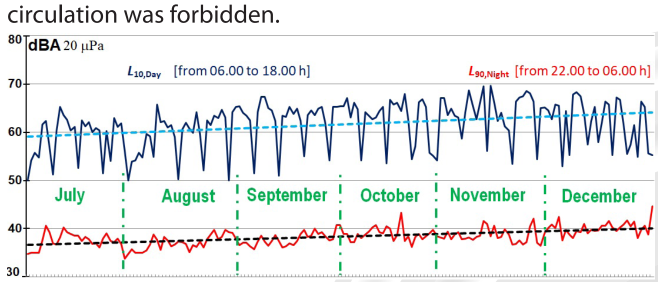

Fig. 12: $L_{10,Day}$ and $L_{90,Night}$ evolution from July through December 2020

In Fig. 12 the long-term trend for each time-history is added: For $L_{10,D}$ trend is the embed light-blue dashed line, for $L_{90,N}$ trend is the embed black dashed line; where one can clearly observe how the daytime sound levels have been increased about 5.5 dBA, and for nighttime the average increasing is close to 4 dBA.

10. CONCLUSIONS

The SARS-CoV-2 virus is producing a social change all over the world, the suspension of international flights and airports lockdown, quarantine, confinement and social isolation (except for a few countries), reduced to a minimum the people mobility, and as a consequence, all environmental factors were reduced as never before could have been imagined, sound levels decreased to such a level, that in the cities it was possible to listen birdsongs again.

This article shares the results that have been obtained from a sound monitoring, which in its conception was to record the sound levels produced by aircraft overflights, and ended up becoming a long term research project, and also it presents the sound levels in Magdalena del Mar before and during COVID-19 pandemic in the year of 2020, using different sound descriptors to find out objectives parameters (L_{Aeq}, L_{den}, L_{10}, L_{90}, noise climate, trend, etc.) as tools to analyze the soundscape behavior.

The psychological annoyance produced by airplanes noise which passing-by during night hours and principally on dawn were important, but as a consequence of the airport closure for almost 8 months, it was possible to measure an average of 12 dBA less in night hours during confinement order, meaning 800% less of acoustic energy.

All data collected in this survey will also shall be useful as informative material for governmental authorities into environmental matters, since it was possible to record the lowest possible sound level, given that it is always a matter of discussion what would be the adequate values of environmental quality standards for urban noise. More analysis than those presented here could be carried out, but the objective of the authors is to share, using simple tools, the soundscape modification due to COVID-19 pandemic in Magalena del Mar, a Lima district, Peru.

A special scenario took place as a consequence of lockdown and quarantine: Due to Lima City became silent, wild birds returned to parks and took over the soundscape, so it was possible to hear every dawn a birds' call concerto, and the neighborhood with no early flights could wake up in a healthier mental situation.

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