Asia-Pacific
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Advancing Free Trade
for Asia-Pacific Prosperity

Early Hearing Damage Prevention Due to Recreational Noise Exposure in Young People: Prevention Recommendations and Initiatives

APEC Health Working Group

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APEC Project: HWG 02 2019A

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PREFACE

APEC economies have committed to the goal of raising awareness about the importance of health and its economic impact, promoting the creation of healthier practices for the region through different cross-economy collaborations.

One of the main issues that have a growing impact on the worldwide population is early hearing damage due to recreational noise exposure. WHO estimates 1.1 billion young people are at risk of hearing loss due to recreational noise exposure.

Hearing loss has a functional, social and emotional impact and decreases economic productivity. It is estimated that the total global economic costs of hearing loss exceeded $981 billion. Instead of paying the fees of disability pensions, designing a more inclusive system and working on small reductions in prevalence and severity of hearing loss could avert substantial economic costs to Economies (McDaid et al., 2021[1]).

Among the causes of hearing loss, we found noise-induced hearing loss (NIHL). Recreational noise exposure can cause damage to the auditory system. Currently, the young population are exposed daily to noise since the more youthful and teenager stage of their life. The hearing loss from noise exposure is not recoverable, but it is preventable, hence the importance of the current project and future initiatives for prevention.

The project HWG02 2019A aimed at:
1. Raise awareness in policymakers on strategies, policies, protocols, and regulations for designing and implementing programs and policies to prevent hearing damage due to noise exposure.
2. Promote APEC members to share lessons about early prevention of auditory damage due to recreational noise exposure.
3. Build capacity to formulate strategic actions related to prevent hearing damage due to noise.
4. Connect people who are experts and stakeholders in this topic in their respective APEC economies.
5. Strengthen systems research in health policy related to preventing hearing damage due to noise in the Asia Pacific, particularly in developing economies.

To achieve it on 19 to 23 April 2021, the "Symposium on Early Hearing Damage Prevention due to Recreational Noise Exposure in Young People" (HWG02 2019A), initiated by Chile and co-sponsored by Australia; Peru; Viet Nam; Mexico and Russia was held on virtual mode.

[1] McDaid D, Park A La, Chadha S. Estimating the global costs of hearing loss. *Int J Audiol*. 2021;60(3):162-170. doi:10.1080/14992027.2021.1883197

ACKNOWLEDGMENT

We would like to thank APEC Secretariat, APEC member economies and Health Working Group of APEC for its support of this project. I´d also like to thank the co-sponsoring economies Australia; Peru; Viet Nam; Mexico; and Russia.

We also want to thank Australia; Brunei Darussalam; Mexico; New Zealand; Thailand; The Republic of the Philippines; and Indonesia, who filled out the survey of assessment of current state on APEC Economies on prevention of recreational noise exposure which strongly promoted the project and made the accomplishment more concrete.

Furthermore, we like to thank the contributions of all speakers, experts nominated by Russia and Malaysia and participants nominated by APEC members and non-APEC Economies who attended and shared their valuable experiences in all activities of symposium. The final report could not have been accomplished without all of them.

We would like to make special recognition to all the team at the Institute of Public Health of Chile, International Cooperation Office of Health Ministry of Chile (OCAI) and all that supported in the organization and delivery of this symposium. To the scientific committee for their immense support in all technical issues of different stage of the project.

Finally, here we would like to show our gratitude to you all who gave to the project overseer lots of suggestions and comments during proposal and implementation of the project.

PROJECT OVERSEER
T.M. MSc. Natalia Gilbert Hernández
Head of Audiology Section
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CHAPTER 1. General Information

Globally more than 1.5 billion people experience some decline in their hearing capacity during their life course, of whom at least 430 million will require care. Many of these cases of hearing loss can be prevented, for example, noise-induced hearing loss.[2]

The annual cost of productivity, due to unemployment and premature retirement among people with hearing loss, cost $105 billion annually.[3]

According to data from the World Health Organization (WHO), 1,100 million young people (between 12 and 35 years old) are at risk of hearing loss due to their exposure to noise in recreational contexts. It is observed that, in middle and high-income APEC Economies and non-APEC Economies, almost 50% of these young people are exposed to dangerous sound levels from the use of DAP and among those around 40% are exposed to potentially harmful sound levels in clubs, discos and bars (WHO, 2021)[2].

If no effective hearing health strategies are applied, the impact of hearing loss in APEC Economies will increase over years.

Investment to apply primary, secondary and tertiary strategies to prevent hearing loss and to promote inclusion and opportunity in workplaces for people with hearing disability increases a person's chance of employment, earning potential and provides equal opportunities between individuals, allowing APEC Economies to grow with improvements in their social welfare and economy.

As a starting point to address this issue, the project "Symposium About Early Hearing Damage Prevention in Young People" (HWG02 2019A) was funded through the APEC Support Fund (ASF) - Sub-Fund on Innovative Development, Economic Reform and Growth.

The project HWG02 2019A promotes the adoption of a deep spirit of cooperation, multidisciplinary, cross-sectorial and cross-economies of Asia-Pacific approach to address the problem and impacts of hearing loss like a community.

The overarching goal of the project HWG02 2019A is to promote APEC members to share knowledge and learned lessons about early prevention of auditory damage in young people with recreational noise exposure through the symposium, to favor the application of good practices about auditory health prevention and safe hearing, and hence to contribute to reducing the impact of hearing loss in APEC Economies.

The objective of this report is to systematize the results in the survey about the actual state of APEC Economies on Recreational Noise Exposure prevention and the experience of symposium participants through a review of presentations of the experts, where different prevent recommendations were exposed.

Also, it systematizes the experience and results of the workshop, where the participants proposed creative solutions to prevent damage due to recreational noise exposure in young people among APEC economies, using a design thinking methodology.

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[2] World Health Organization. *World Report on Hearing*.; 2021. https://www.who.int/publications/i/item/world-report-on-hearing

[3] World Health Organization. Global costs of hearing loss and cost-effectiveness - Executive summary. *World Heal Organ*. 2017.

Finally, all the initiatives discussed during the workshop helped to present in this report a proposed 'road map' for APEC Economies.

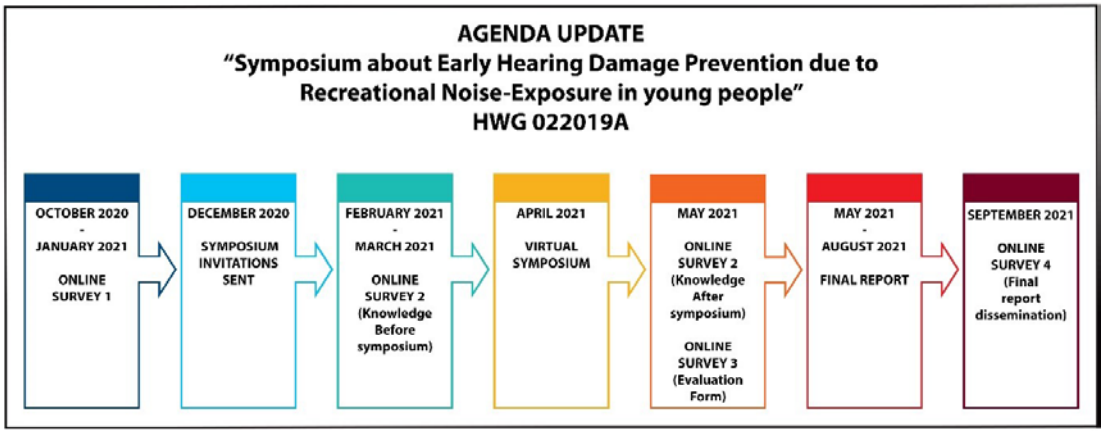


Figure 1-1. The Roadmap of the project HWG02 2019A

CHAPTER 2. Assessment of current state on APEC Economies on prevention of recreational noise exposure

As part of project number HWG02 2019A, the organiser team sent an official invitation to fill out a *multiple-choice survey about main preventive measures for recreational noise-induced hearing damage and the challenges faced by APEC economies in early hearing damage prevention*. Results used as preliminary contextual information about the economies, which served as an input to elaborate the agenda of the virtual symposium and to make a previous diagnosis about this issue in APEC Economies.

The survey was designed by the Audiology Section of the Occupational Health Department of the Public Health Institute of Chile. It divided into eight sections, where the perceptions and opinions about the economies' current state and whether or not there some item of prevention in economies ("yes", "no", "unsure of the existence") were evaluated. Furthermore, the survey asked the Economies about their stakeholders and principal challenges in this issue.

Survey sections:

1. Public policies, legislation, protocols, and technical guides about hearing damage prevention due to recreational noise exposure;
2. Technical documentation for the concerned parties on recreational noise prevention;
3. Health system and government initiatives for the prevention of hearing damage from exposure to recreational noise;
4. Education system and government Initiatives for the prevention of hearing damage from exposure to recreational noise;
5. Research on the prevention of hearing damage from exposure to recreational noise;
6. Application of recommendations and good practices of preventive measures for hearing health;
7. Identification of stakeholders supporting the implementation of preventive measures for hearing damage from exposure to recreational noise; and
8. Self-perception about the principal challenges in your APEC economy.

2.1 VALIDATION SURVEY

To ensure the quality of the content and information gathered by the survey, it validated by an expert committee composed of eight different health-related professionals in Chile. The members of the comitte have 5 to 24 years of professional experience and academic knowledge in the areas such as audiology (4 experts), otorhinolaryngology (1 expert), sound and acoustics (2 experts) and social sciences methodologies (1 expert).

The method used for validation was the expert's judgement, who evaluated the following aspects:

- Appreciation of the survey's format aspects
- Time and difficulty to answer the questions
- Survey's content

For the survey's content evaluation, the degree of agreement among all experts were evaluated considering the criteria of sufficiency, coherency, relevance and clarity using a Likert scale with options of 1. No compliance, 2. Low compliance, 3. Moderate compliance, and 4. High compliance.

For each question, the percentage of experts who considered that the survey had high compliance (option 4) standards calculated from the content answers gathered was measurement. Then, the V of Aiken from the total of experts was measured, considering V of Aiken value ≥0,88 to be considered valid with a statistical significance of < 0,051

The recorded experts' observations for each section compared with V of Aiken's results to identify those questions that needed to be modified. Based on the results of the first evaluation, the modifications made incorporated into the survey. Then the Audiology Section sent the survey modified back for a second revision of the experts' committee. The committee followed the same criteria as the first evaluation.

Finally, the overall survey and its content were approved, according to the selected validity content criteria.

2.2 RESULTS

The conducted survey was answered by 9 APEC economies, including **Chile; Peru; Mexico; Thailand; The Republic of the Philippines; New Zealand; Australia; Indonesia and Brunei Darussalam.** Over 40% of the participants were female, about 90% claimed to belong to the health work field and only 10% to the occupational health work field. Also, most of these economies claim to have both environmental (89%) and workplace (100%) regulations noise standard in their economies.

2.2.1 Public policies, legislation, protocols, and technical guides about hearing damage prevention due to recreational noise exposure.

According to the responses received by the nine APEC economies concerning public policies, legislation, protocols, and technical guides about hearing damage prevention due to recreational noise exposure, APEC Economies claimed to perceive that there are initiatives concerning public policies in most of them (89%), and 56% of these initiatives are the government (Figure 2-1 a).

When consulting Economies about their general perception about whether or not there any laws, norms or protocols address recreational noise prevention, 45% of there Economies claimed yes, and 44% of Economies claimed not unsure of whether or not it exists (Figure 2-1 b). When asked to Economies about more specific situation laws, norms or protocols, the distribution of responses indicate that in many cases unsure of

whether or not exist it, except to the items about use of personal hearing protection (Figure 2-1 d) and regulation recreational noise levels at mass events (Figure 2-1 e), where the most of Economies claim no exist it (56% and 56% respectively).

Finally, for this section, when consulting APEC Economies about have research studies to assess the application of the existing recreational noise laws and protocols the 34% of Economies claimed yes and 11% claimed no; however, 22% of Economies claimed not applicable (Figure 2-1 h), that means that 22% have answered that no existing laws, norms or protocols in all previous questions about this section.

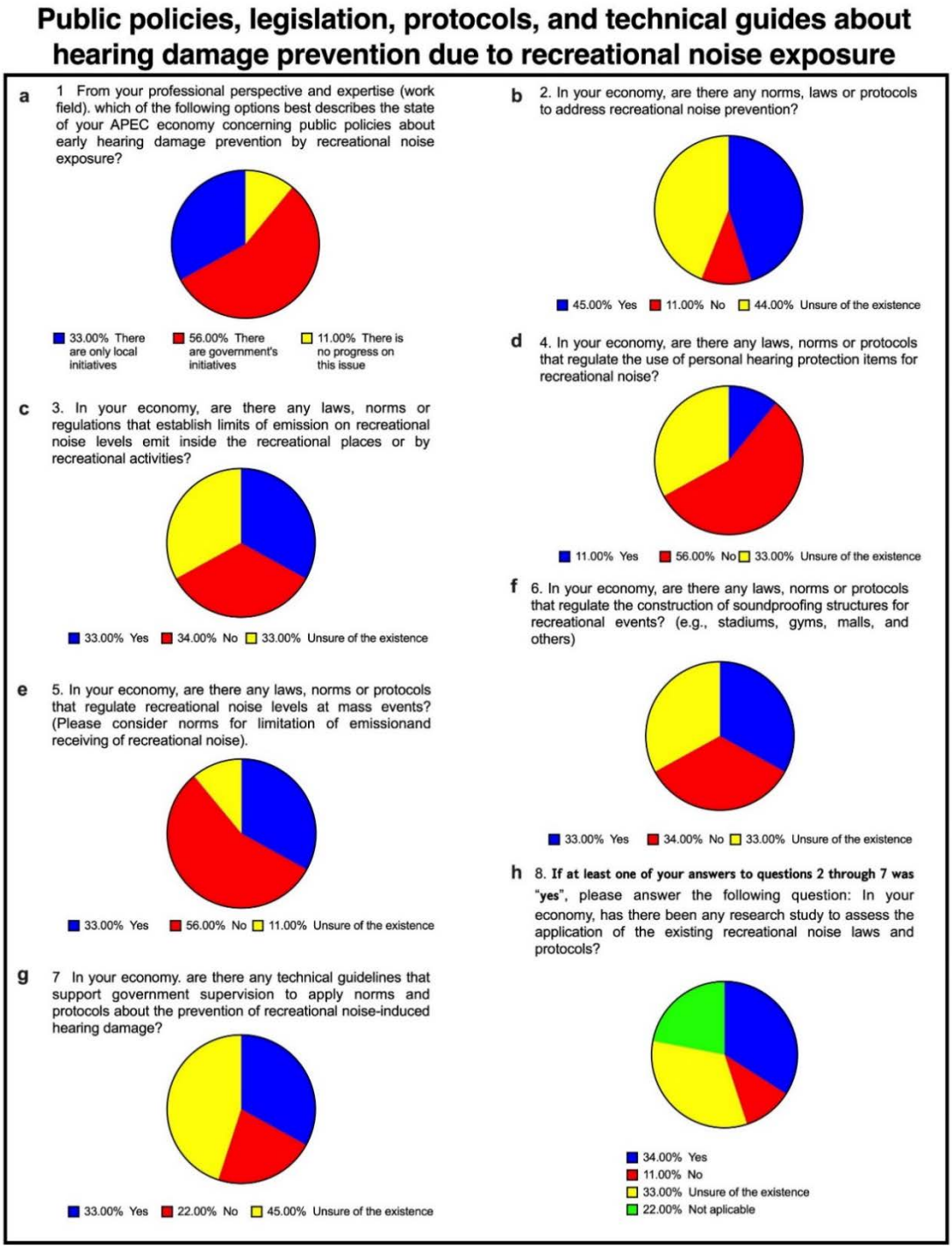


Figure 2-1.

2.2.2 Technical documentation for the concerned parties on recreational noise prevention.

Regarding If technical documentation on recreational noise prevention for the concerned parties (as owners of public recreational places and the general public) elaborated by a governmental entity, private organisation, academic organisation or scientific societies of their Economy exist or not, most of nine APEC Economies (56%) claimed no exist specific technical documents to guide the owners of public recreational places (e.g., bars, pubs, nightclubs, theatres, malls, stadiums) on this issue (Figure 2-2 a).

For the general public, 44% of nine APEC Economies claimed yes there technical documents to inform the public about the risks of hearing loss from frequent attendance at recreational venues with high-intensity recreational noise levels (Figure 2-2 b). 45% of these Economies claimed no technical documents to inform the public about the risks of hearing loss from listening to music frequently with earphones/headphones at a high volume level and/or for too long (Figure 2-2 c).

Finally, for this section, when consulting about having research studies to assess the effectiveness of the recommended measures provided by these documents, 67% of Economies claimed unsure of the existence of this research (Figure 2-2 d). However, no one answers not applicable, which means that 100% of Economies in this report have at least one technical documentation on recreational noise prevention for the concerned parties related to previous questions in this section of the survey.

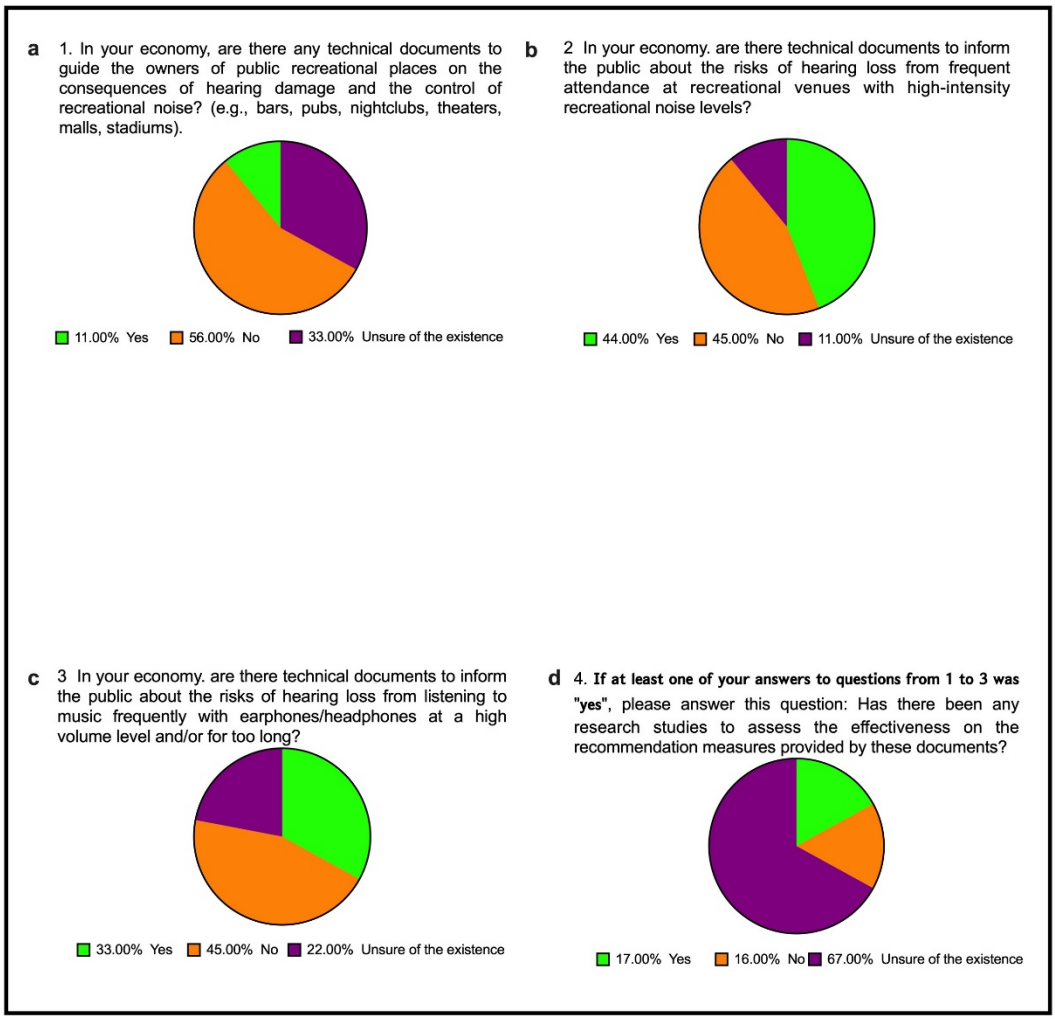


Figure 2-2.

2.2.3 Health system and government initiatives for the prevention of hearing damage from exposure to recreational noise.

When consulting APEC Economies about Health system and government initiatives to prevent hearing damage from exposure to recreational noise, most of these nine APEC Economies (45%) claimed to have public health programs that include hearing healthcare concerning recreational noise (Figure 2-3 b). On the other hand, 56% of them claimed to no when consulting about the existence of a validated questionnaire to assess recreational noise exposure in their economy (Figure 2-3 a), and 67% of them claimed to no exist hearing screening program for the young population (12 to 35 years) (Figure 2-3 c).

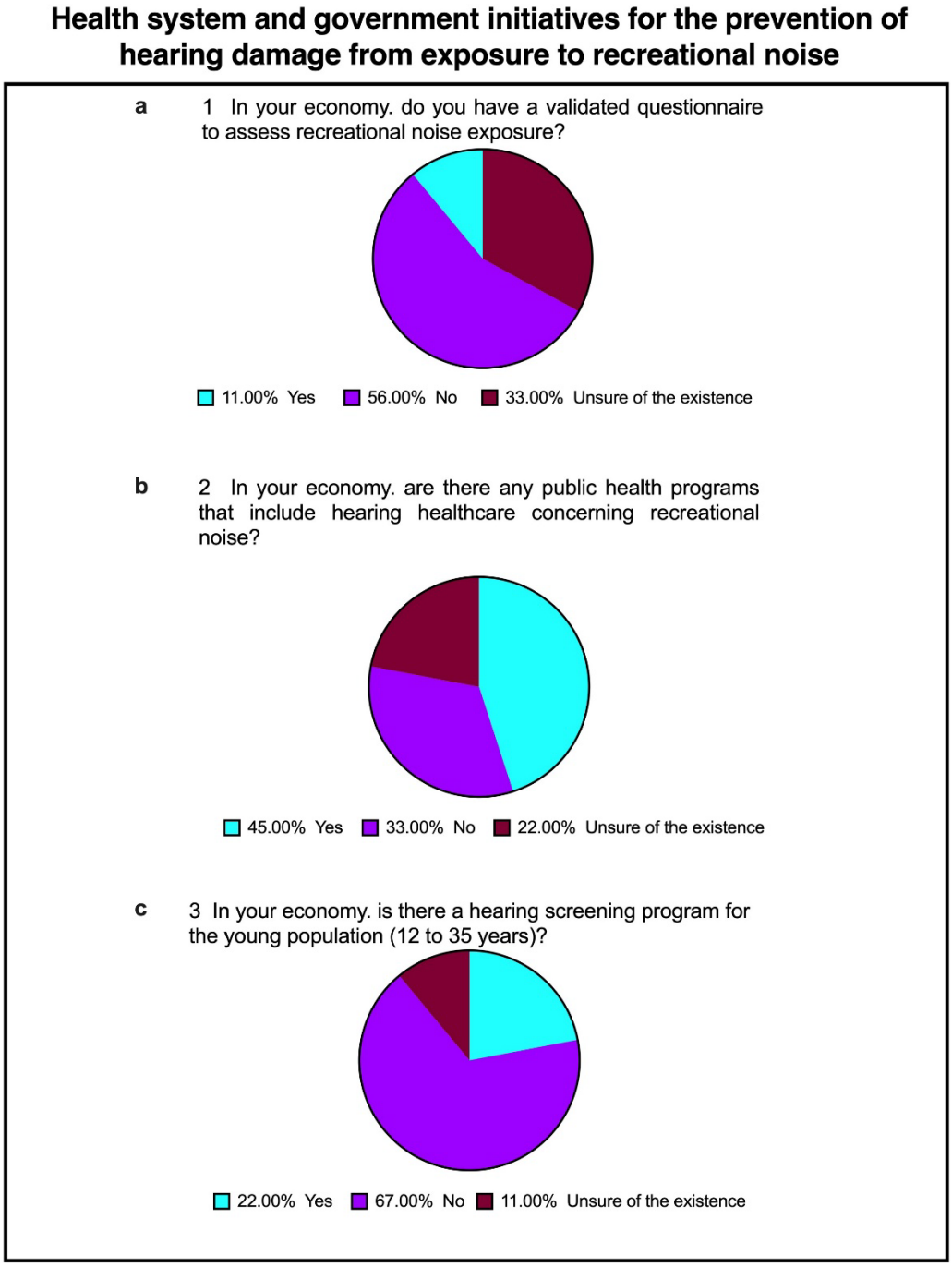


Figure 2-3.

2.2.4 Education system and government Initiatives for the prevention of hearing damage from exposure to recreational noise

According to the responses received by the nine APEC economies concerning education system and government initiatives for the prevention of hearing damage from exposure to recreational noise, the distribution of responses indicates that in many cases not exist programs educational as an initiative for differents stakeholders by governments (Figure 2-4 shows the distribution of all answers in this sections). However, 56% of these nine APEC Economies claimed hearing healthcare included in

the curriculum of education-related professionals (e.g., teachers) and/or health-related professionals (e.g., nurses) (Figura 2-4 e).

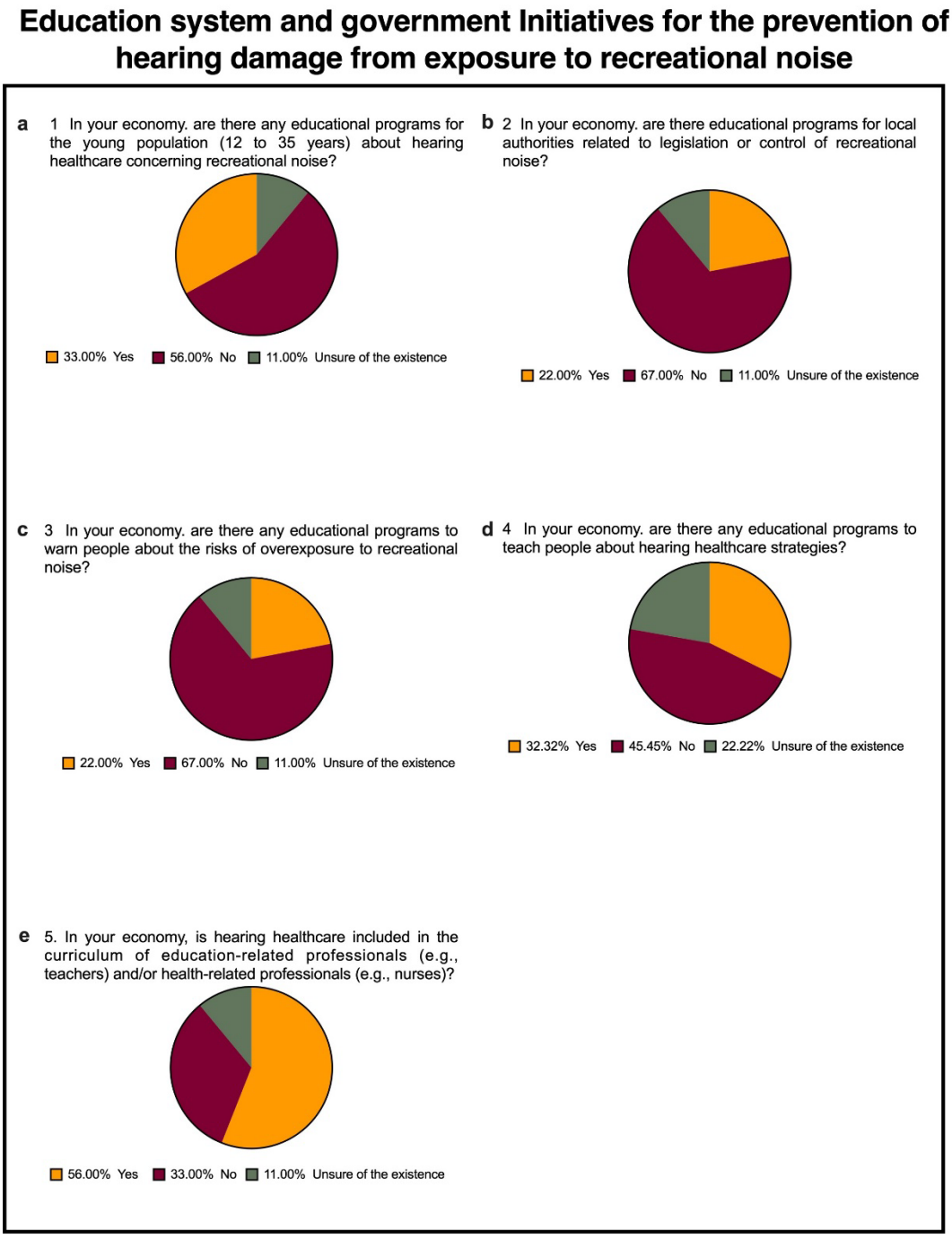


Figure 2-4.

2.2.5 Research on the prevention of hearing damage from exposure to recreational noise

The answers from these nine APEC Economies about research on preventing hearing damage from exposure to recreational noise suggest that they perceive research on this issue is low on matters of the prevalence, impact and effectiveness of preventive strategies.

When comparing the distribution of answers in question 1 with question 2 could suggest that the research for recreational noise exposure is perceived mainly in young people, and also it alludes to that the perception of health consequences most studiest are the impact of hearing loss. Because 44% of these nine APEC Economies claimed to have research about impact and prevalence in young population in hearing loss (Figure 2-5 a), and when consulting about the same type of research in other health consequences and without an established study population, the percent to answer “no” was the same in both cases, and the answer “yes” is only reduced to 33% of them (Figure 2-5 b).

Regarding the research of the effectiveness of preventive strategies, 56% of these APEC Economies claimed no exist (Figure 2-5 c).

Finally, the homogeneous distribution on the answer of perception for these APEC Economies on the funds available for developing research this topic (Figure 2-5 d) could explain in part the low-level perceived by these APEC Economies in research on this issue. Because both the answer “no” and answer “unsure” of the funds available to conduct research related to hearing healthcare or recreational noise prevention measures reflect don´t have resources for conduct research related to this issue.

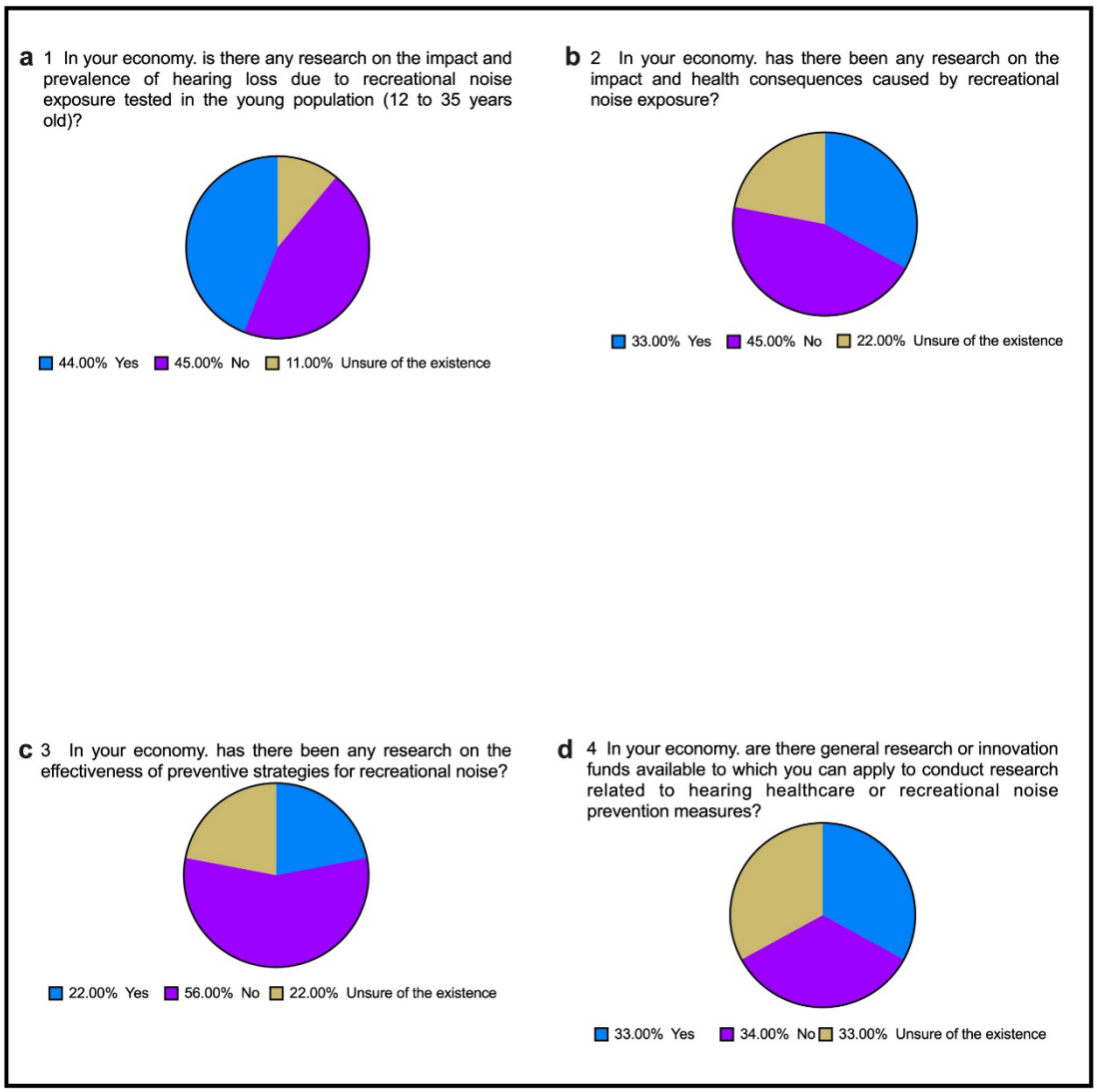


Figure 2-5.

2.2.6 Application of recommendations and good practices of preventive measures for hearing health

When consulting APEC Economies about the application of recommendations and good practices of preventive measures for hearing health of the World Health Organization (WHO), 67% of these nine APEC Economies claimed to take into consideration and followed it, 11% of these claimed no, and 22% claimed unsurely about it (Figure 2-6 a).

Regarding the knowledge and application of their Economies to WHO's Make Listening Safe; 33% of them claimed yes, 45% of them claimed no and 22% of their claimed unsurely about it (Figure 2-6 c).

The percentage of claimed unsurely about consideration and application of WHO recommendations could explain due to don´t know about WHO statement and the “make listening safe” program (Figure 2-6 b)

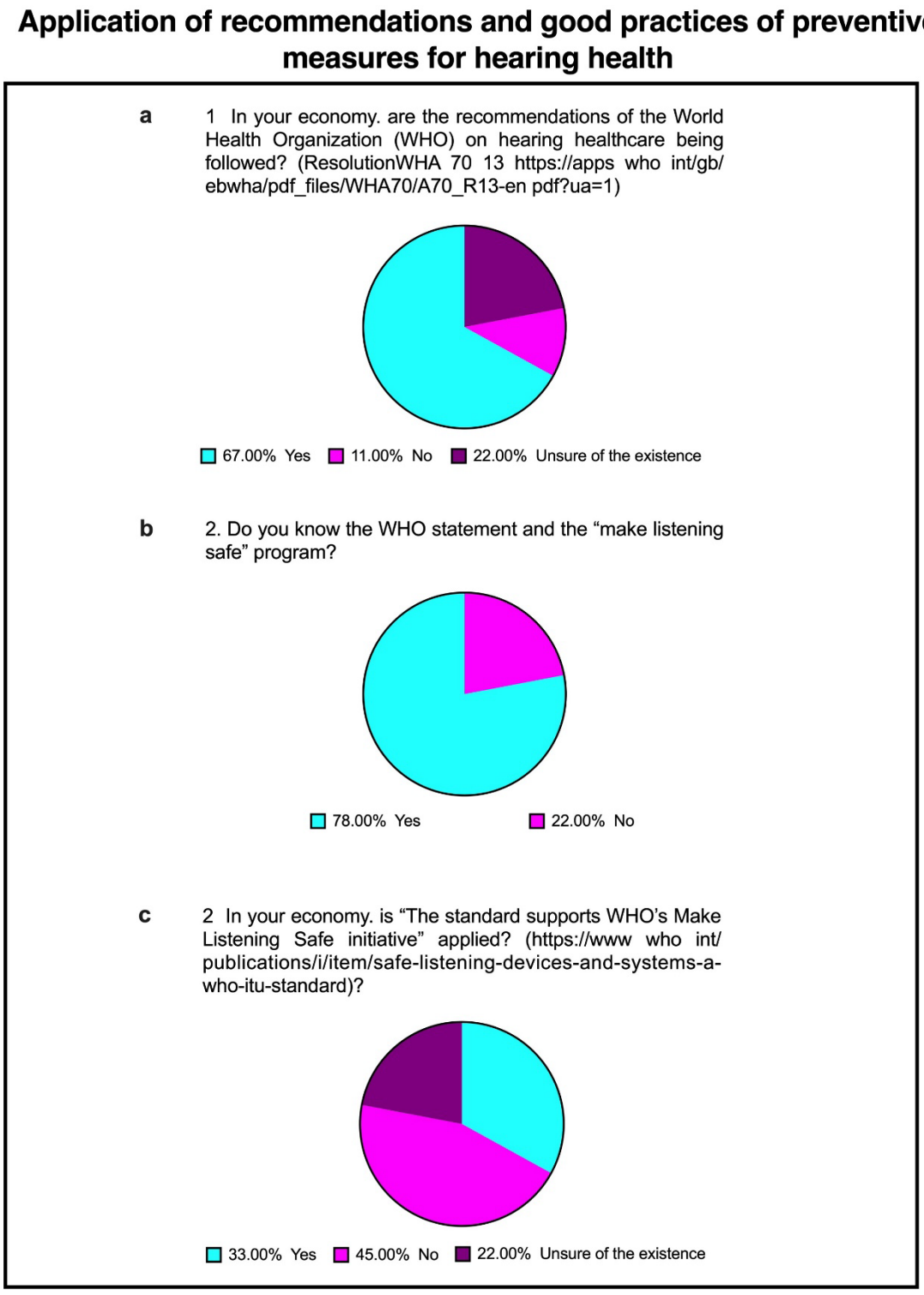


Figure 2-6.

2.2.7 Identification of stakeholders supporting the implementation of preventive measures for hearing damage from exposure to recreational noise

In this section, these nine APEC Economies identified some stakeholders in their economies that could support preventive measures for hearing damage from exposure to recreational noise. These stakeholders were government institutions in charge of health policy issues, private organisation, academic organisation, scientific societies, and ONGs.

The distribution of the answers was homogenous for the consult if there is a specific institution in charge of the recreational noise policies (Figure 2-7 a). Also, when consulting about if there a technology industry that produces personal listening devices, cell phones, communication technologies, etc., 45% of these APEC Economies claimed “no” (Figure 2-7 b). Finally, when consulting about any institutions (public, private, academia, or NGOs) that play a key role in implementing recreational noise damage preventive measures, 45% of these APEC Economies claimed “yes” (Figure 2-7 c).

All these suggest that we have more probability found stakeholders that play a key role in implementing any preventive strategies than one specific stakeholder in charge of recreational noise policies in these nine APEC Economies.

Identification of stakeholders supporting the implementation of preventive measures for hearing damage from exposure to recreational noise

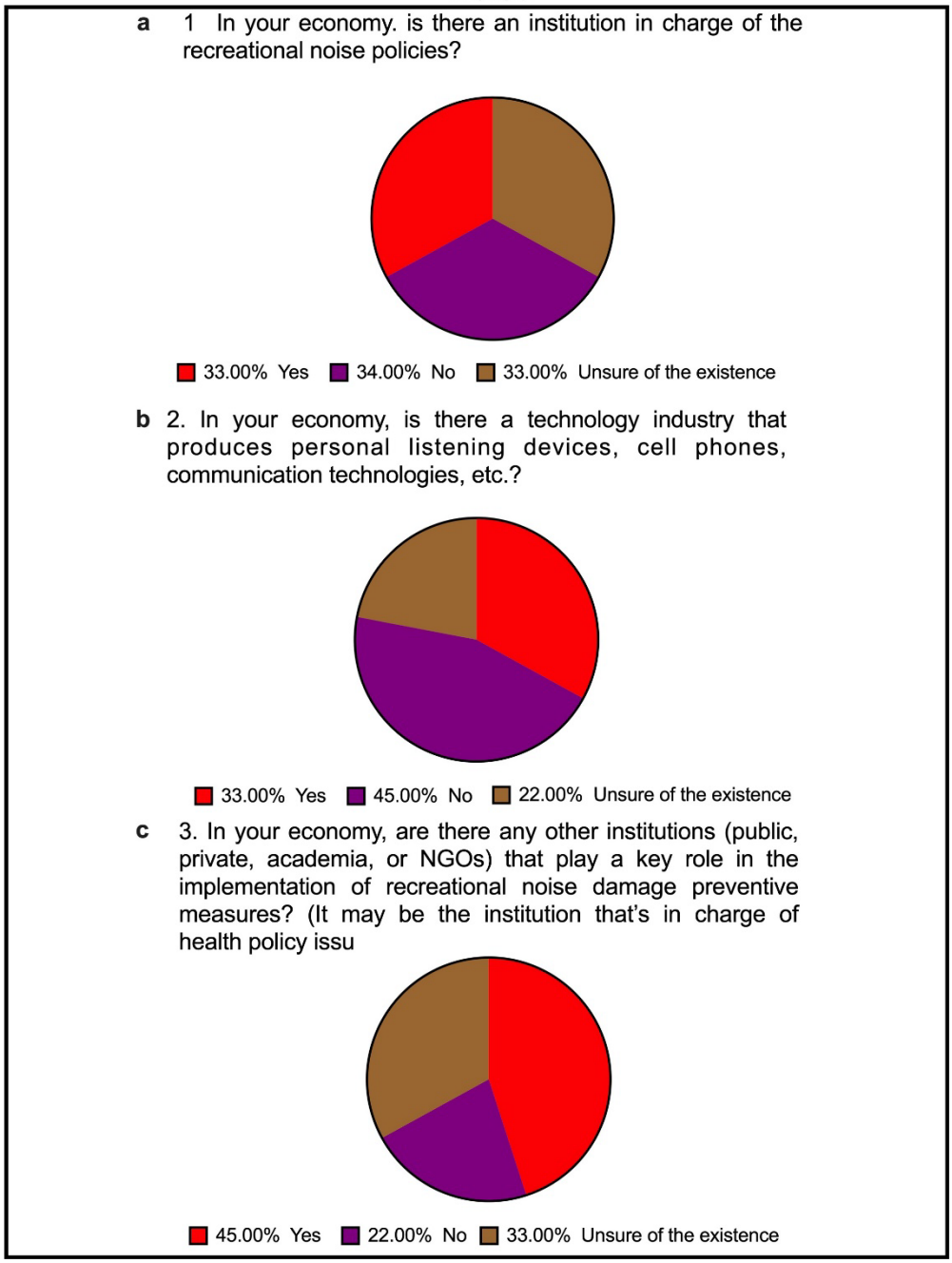


Figure 2-7.

2.2.8 Self-perception about the principal challenges in your APEC economy

The answers from these nine APEC Economies about Self-perception about the principal challenges for them to adopt and implement the preventive strategies for recreational noise exposure suggest that the three more important are lack of public policies, lack of knowledge or information to the public and lack of research on the matter (Figure 2-8).

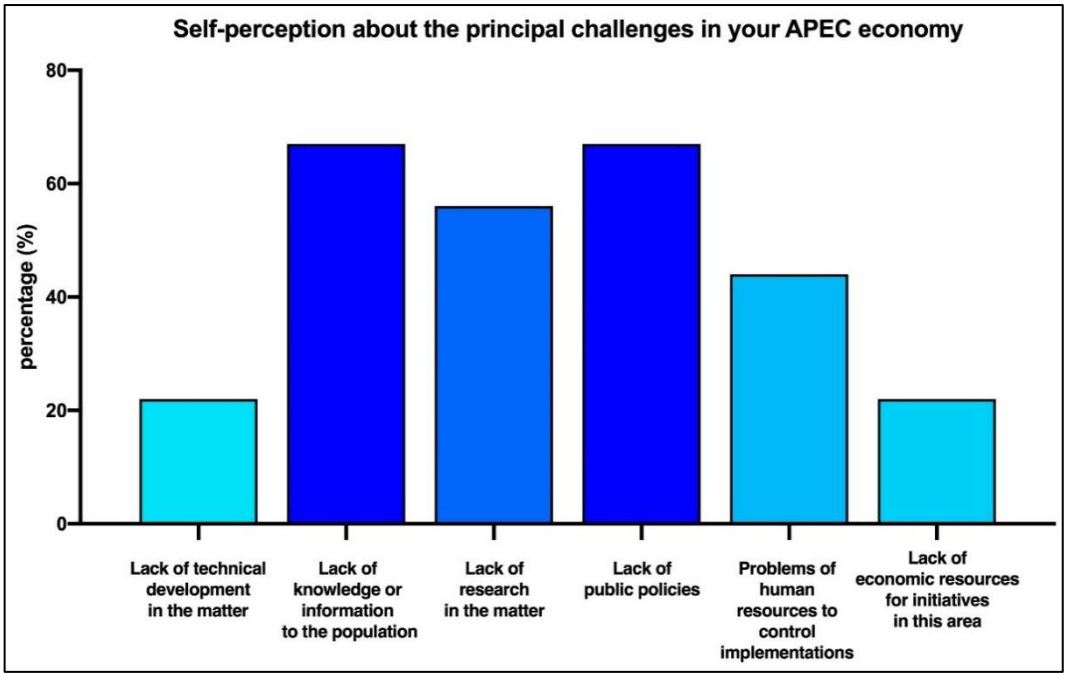


Figure 2-8.

2.3 CONCLUSIONS OF THE SURVEY

Over the past years, the different APEC's economies have been raising awareness of hearing loss due to recreational noise exposure among their population to reducing the prevalence of hearing loss.

Most of these economies have both environmental and workplace regulations noise standards (regulations).

Nevertheless, the results of this survey show us some challenges to APEC Economies to work to improve their current prevention status on this issue.

The identification process of these challenges represents a growing opportunity for APEC economies to align and reflect upon their experiences and knowledge on hearing loss prevention strategies and develop future guidelines for the region.

CHAPTER 3. Virtual Symposium

The "Symposium about early hearing damage prevention due to recreational noise" was a 4-day online event held virtually over the website https://hearing-symposium.com/ from 19 to 23 April 2021.

All 21 APEC economies were invited to join throughout an invitation (General Information Circular) circulated by the APEC secretariat. Beyond the APEC economy members, some participants non-members (Guest) also invited to join the symposium and participate in the activities.

The symposium was a social and science gathering of APEC Member Economies' organisations involved in designing and conducting hearing loss prevention programs policies, and evaluations. Also, representatives from relevant academic institutions, researchers, and international organisations.

During the symposium, we discussed some preventions strategies to avoid hearing loss due to recreational noise exposure. We also identified iniattives to inspire future recommendations for APEC economies' health hearing programs and politics.

A total of 99 people finally participated in the event, distributed between 13 APEC Member Economies and guest, as shown in figure 3-1.

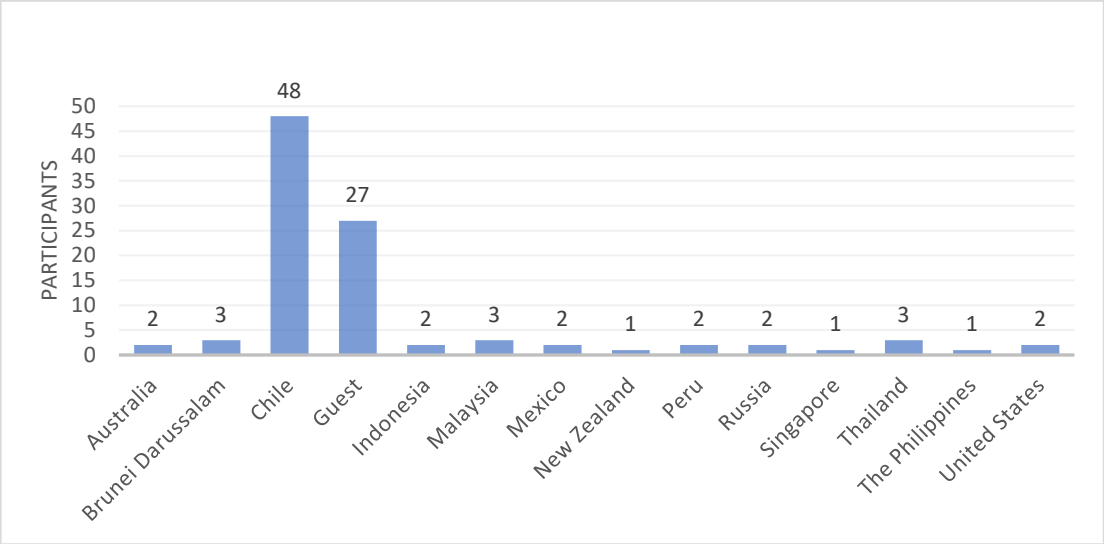


Figure 3-1. The bar chart displays the symposium participants per APEC Economies and guest. APEC Economies and guest are along the x-axis and Participants numbers are along the y-axis. The guest value was calculated by adding all participants and experts of economies non-members.

Regarding the gender distribution of symposium attendants, 55% of there was female, and 45% of there was male (Figure 3-2).

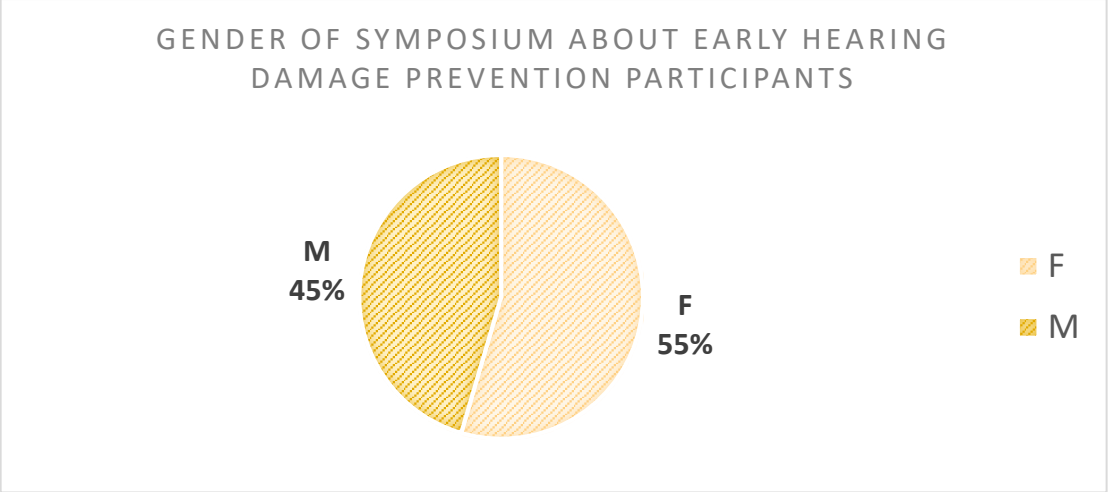


Figure 3-2.

The symposium considered the participation of key stakeholders from different types of organisations; Private, International Organization, Government and Academia. Most participants belonged to the government organisation (Figure 3-3), followed by academic researchers and representatives from the private sector. Few people from the international organisation area attended.

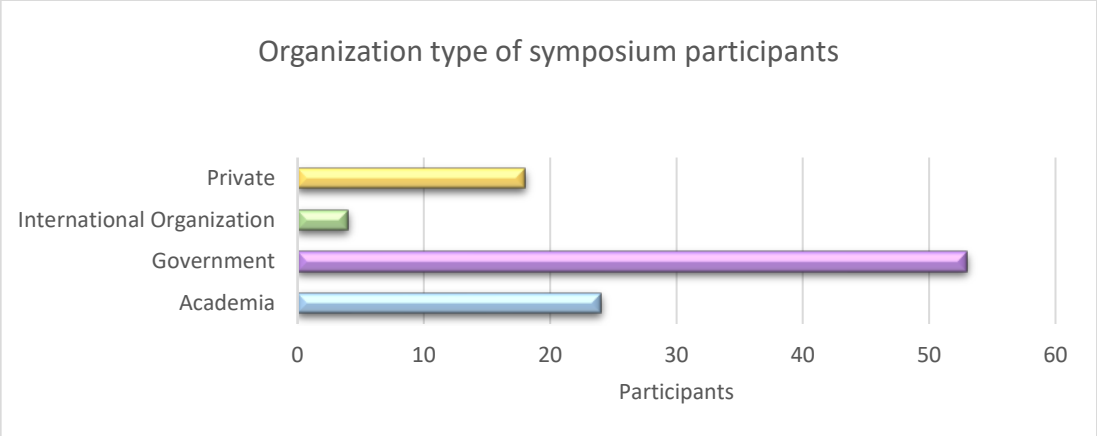


Figure 3-3.

As regards gender representation, there was a tendency towards equal representation in most organisations types. Inside the government institutions, the difference between female and male representatives accentuates, favouring female representation. This is also the case for the academic sector, where the amount of female representation was also higher than that of males (Figure 3-4).

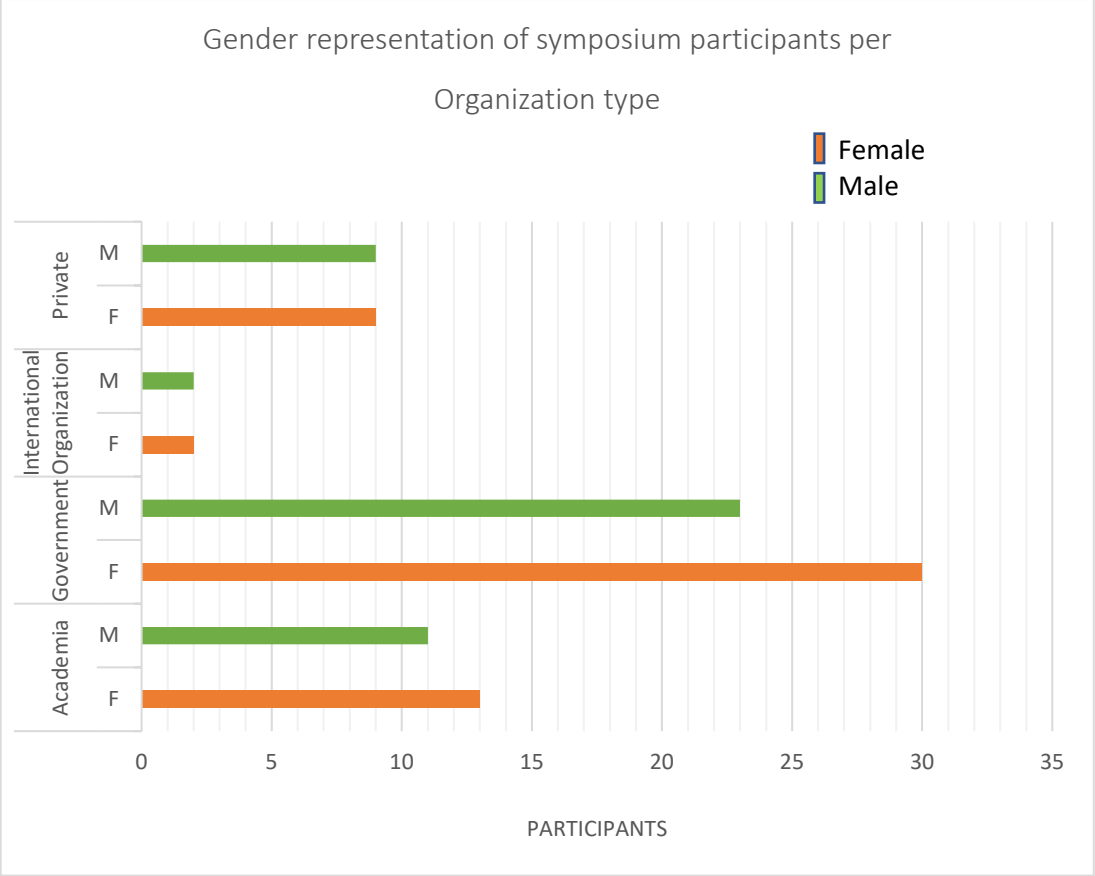


Figure 3-4.

As this event was virtual, we were interested in measuring the access to the website and interaction with the items that we established to facilitate the participants' participation with a very different time zone compared to the Chilean time zone.

All information on participants and experts interaction on the website during the symposium was estimated using Google Analytics. Google Analytics is a website traffic analysis application that provides statistics and analysis of the total interaction with the items of the website.

Using this application, we could identify the interaction of participants with the different items of the website during the symposium; the home of the website was the item with more access, then schedule, showing that participants were aware of days activities. Documents and videos had a high interaction, showing genuine interest by participants to watch presentations and learn about this topic (Figure 3-5).

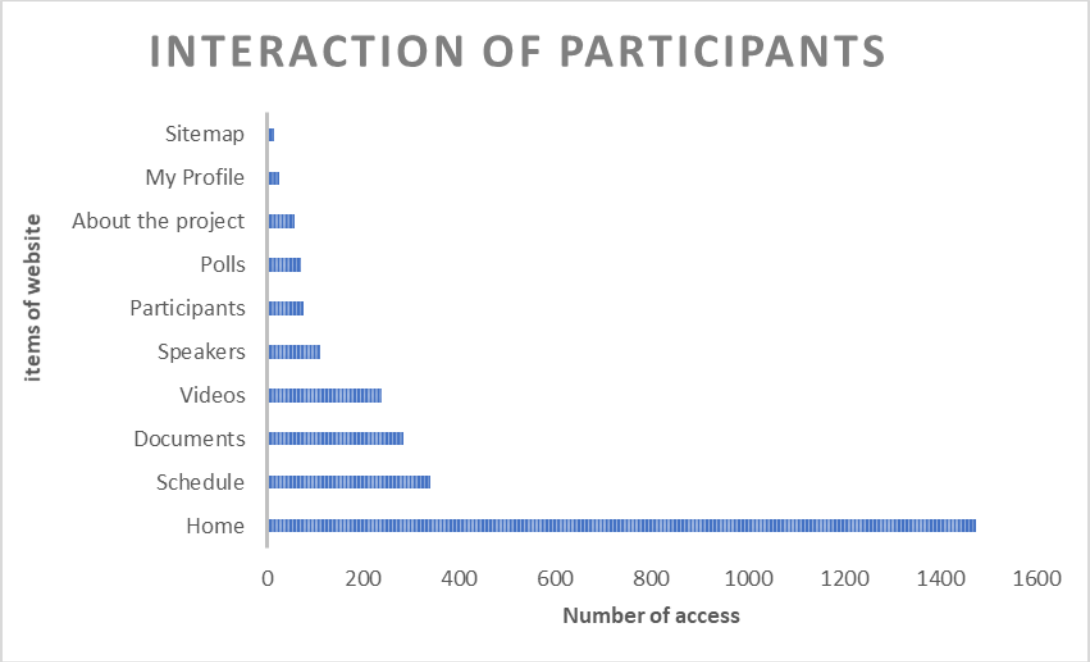


Figure 3-5. The bar chart displays the interactions on each item of the website for each access during all symposium. Numbers of access are along the x-axis, and website of symposium items are along the y-axis.

3.1 OPENING REMARKS

Dra Paula Daza
Public Health Undersecretary
Ministry of Health of Chile

Good morning, good afternoon, and good evening for everyone distinguished guests, dear colleagues, ladies and gentlemen.

It is a true pleasure for me to be here today in the opening of the Symposium on “Early hearing damage prevention due to recreational noise exposure in young people”.

First of all, I would like to thank APEC for its support to this project presented by Chile and also, to the Secretariat of Health Working Group and Life Science and Innovation Group for his support in facilitating the organization of the symposium.

I would also like to thank the participation of Australia; Brunei Darussalam; Indonesia; Malaysia; Mexico; New Zealand; Peru; Russia; Thailand and The Philippines; the collaboration to all the international and national speakers that this Symposium will have; and to all our guests that are connected. It is really a pleasure to have you all.

I remember when its project was just a concept note submitted in the Puerto Varas session, and now we are all here.

Hearing loss has a functional, social, and emotional impact and decreases economic productivity. The new findings estimated that the total global economic costs of hearing loss exceeded US$ 981 billion due to the enterprise’s staff reduction and premature retirement among people with hearing loss.

The different levels of hearing loss prevention increase a person’s chance of employment and earning potential. The investment in hearing health provides equal opportunities between individuals, allowing economies to grow and improve in social welfare.

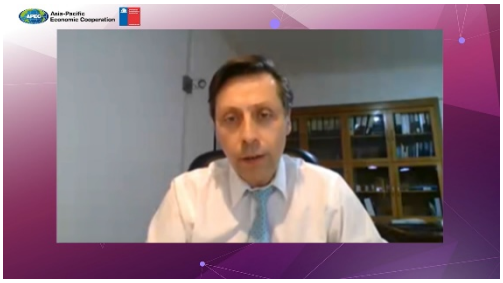
APEC economies have committed to raising awareness about the importance of health, and it is economic impact, promoting the creation of healthier practices for the region throughout different across-economy collaborations.

It is imperative to design a more inclusive system and work on small reductions in prevalence and/or severity of hearing loss to avoid substantial economic costs to society.

With this in mind, we proposed to work to reduce the impact of hearing loss in APEC Economies. To do this, we established like a first approach the early hearing damage prevention due to recreational noise in young people, through holding a Symposium, where we will look to identify some prevention strategies.

Having said that, we want to reiterate our gratitude to all the participants, and I want to thank you for your invitation. I hope this important symposium would make a difference in the coming years.

Thank you very much



QF Heriberto García
Director (S)
The Public Health Institute of Chile.

Good afternoon.

First of all, I would like to thank the presence of our Public Health Undersecretary, Dra Paula Daza, Occupational Health Department Head of The Public Health Institute, Dr Patricio Miranda, the delegates from each APEC Economies, and to all who accompany us.

The purpose of this instance is looking to promote exchanges in knowledge and good practices on preventive strategies for hearing loss due to recreational noise exposure in young people.

These young people enter the world of work with hearing loss condition that will probably be aggravated if the hearing protection elements are not used properly at work.

We acknowledge funds from Asia Pacific Economy Collaboration (APEC), especially the Co-Sponsors Economies for the implementation of this project, Australia; Mexico; Peru; Russia and Viet Nam.

The Public Health Institute of Chile through our Audiology Section have an important role to play related to the detection and early prevention of hearing damage in young people.

It is therefore of great importance to benefit from worktables, which will be carried out during Symposium with all experts. On worktables, the experts will share all their knowledge and expertise on the detection of hearing damage and hearing loss.

It is essential development different preventive strategies to mitigate the hearing damage on peoples, according to with recommendations of WHO - which estimated that the annual cost of the unaddressed hearing loss is more than 980 million dollars - and the International Telecommunication union (ITU) from ONU.

I hope this event will be very useful for all and let us together find solutions to address hearing loss in young people and reduce the impacts of hearing loss.

Thank you very much

3.2 ACTIVITIES OF SYMPOSIUM

The symposium included **the first two presentations days (19 April – 20 April 2021)**, with speakers from APEC Economies and Guest; the details of speakers are as follows;

- Dr Richard Neitzel, PhD, CIH, FAIHA. Associate Professor, Environmental Health Sciences and Global Public Health, University of Michigan School of Public Health.

- T.M. MSc. Natalia Gilbert, Head of Audiology Section, The Public Health Institute of Chile.

- Margareta Bohlin, PhD. Associate professor in Psychology, University of Gothenburg. University West.

- Dra Natalia Tamblay, Auditory Health Program Head, Ministry of Health of Chile.

- John Eichwald, MA. Audiologist, Center for Disease Control and Prevention.

- Dr. Johannes Mulder, Lecturer in Music Technology, School of Music, The Australian National University.

- Mark Laureyns, Lecturer Hearing Aid Fitting, Thomas More University College. Co-chair of the Make Listening Safe Workgroup of WHO.

- Nashrah Maamor, PhD. Senior lecturer of Audiology, The National University of Malaysia.

- Dr Izny Hafiz Zainon, ENT Specialist & Surgeon, Ministry of Health, Malaysia.

- Prof. George A. Tavartkiladze, M.D., Ph.D. National Research Centre for Audiology and Hearing Rehabilitation, Moscow, Russian Federation.

The third day was break day (21 April 2021). All attendants were able to freely navigate the event's website, chat with other attendants, and access videos of the presentations from the first and second day of the event that had become available for all.

The fourth day (22 April 2021) was dedicated to the workshop. Workshop participants built new creative solutions to the early hearing prevention problem using a design thinking methodology guided by professional trainers.

Ultimately, on **the last day (23 April 2021),** the symposium assistants discussed the workshop results to inspire future recommendations and propose iniattives for APEC economies' health hearing programs and politics.

3.3 PRESENTATIONS OF GUEST SPEAKERS

3.3.1 "Recommendations and considerations for a recreational noise exposure limit."

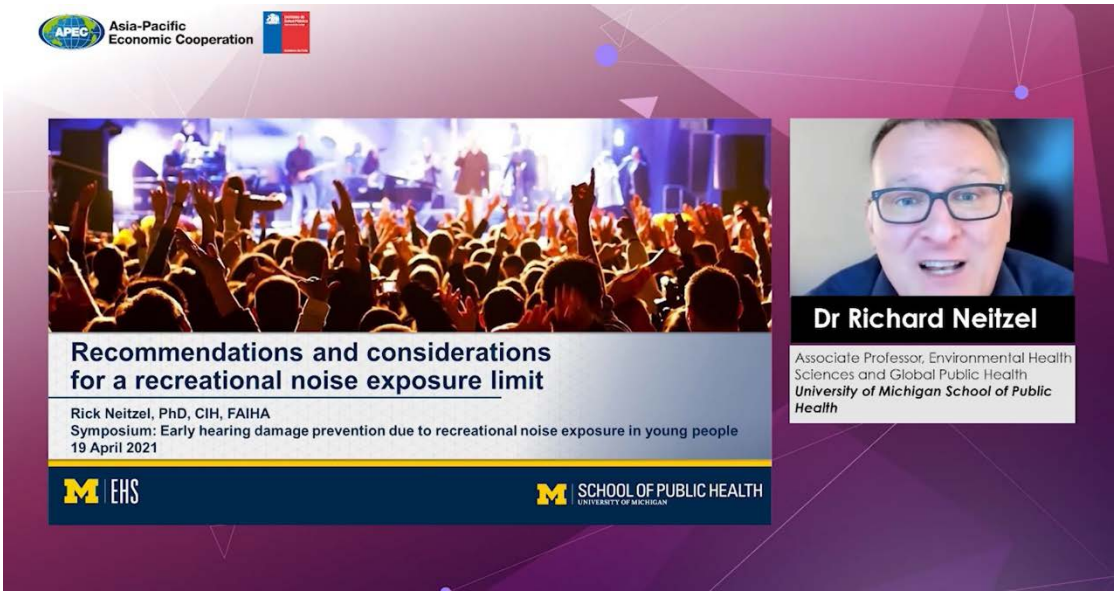


Figure 3-8 presentation of Dr Richard Neitzel

Dr Neitzel began by comparing the current knowledge and research of occupational noise and recreational noise. He remarked that occupational noise had been studied for decades, it is very well characterized, and we have enforceable regulatory limits. In contrast, recreational noise is not well-studied, it is relatively poorly understood and characterized, and we don´t have enforceable regulatory limits; we only have recommended limits.

He comments that the risk of noise-induced hearing loss could be estimated using mathematical models. The noise-induced hearing loss risk models from ISO 1999 and ANSI s3.44 are appropriate for assessing risk from music and likely other recreational noise, however, this model originally is thinking only of occupational noise specify at 75-100 dBA exposure range, and periods of exposure lasting from 0 to 40 years.

Due to an increase in life expectancies that range, Dr Neitzel comment that this range is untenable today and may is more realistic to consider the duration of 60 years (age 10-70).

Regarding Identifying an appropriate exposure limit for recreational noise, Dr Neitzel comments that to **any limit is inherently a political compromise, because requires a definition of acceptable risk of noise-induced hearing loss.** He mentioned that a good idea to identifying an appropriate exposure limit is to take into account the guidance from ANSI S3.44: "The selection of maximum tolerable or maximum permissible noise exposure and protection requirements, as well as the selection of specific formulae for impairment risk assessment or compensation purposes, require consideration of ethical, social, economic, and political factors not amenable to international standardization."

With all this information in mind, Dr Neitzel comments that he and their colleagues **recommend for recreational exposure limit at 80dB Lex,8h. That is equivalent to 75 dBA Leq, 24h, 1-hour Leq of 89 dBA, 15 minutes Leq of 95 dBA.** Because this limit is completely protective for the vast majority of the population and sufficiently protective without being onerous or technically or socially infeasible. Furthermore, is very consistent with the current EU occupational lower exposure action level per EU directive 2003/10/EC.

Also, he mentioned other alternative recommendations;
1) **75dBA Lex,8h; equivalent to 70dBA Leq,24h,** 1-hour Leq of 84dBA, 15-min Leq of 94 dBA. This limit is totally protector for noise-induced hearing loss (zero risks of NIHL) and it adequate for those with limited autonomy, pre-existing loss, or increased susceptibility.
2) **83dBA Lex,8h, equivalent to 78dBA Leq,24h**, 1-hour Leq of 92 dBA, 15-min Leq of 98 dBA. This limit the slightly elevated risk of NIHL, for that reason, is more recommendable for informed individuals who accept a slightly higher risk of NIHL.

Furthermore, he mentioned taking into mind considering that the level established to avoid noise-induced hearing loss, not necessarily protect for another health impact caused by noise exposure.

Also, Dr Neitzel shares his research: Apple Hearing Study, which is a study a partnership between the University of Michigan and Apple. In this study, they are getting information about activities, data of demographics, listening behaviour, perceived hearing as well as the environment in music exposures. Also data from hearing test administering through their own iPhones. He showed the first publication from Apple Hearing Study: "Impacts of COVID-19 related social distancing measures on personal environmental sound exposure."

Finally, to conclude, Dr Neitzel indicates that collectively, we have evidence that the risk of noise and hearing loss remains high in workplaces as well as in communities. We believe that the risk from occupational noise exposure is similar to the risk from music or non-occupational noise exposure in equivalent energy and duration.

We've seen the risk of noise in hearing loss may be influenced by larger societal changes and we strongly believe that the risks of hearing loss need to be communicated effectively often to the public.

Also that **we need additional data to better understand the relationship between recreational noise and noise-induced hearing loss, considering of course as well what people do for work and personal risk factors they have**.

To read the abstract of Dr Neitzel presentation, enter at:
https://revista.ispch.gob.cl/index.php/RISP/article/view/119/131

To acces the complete presentation, you can visit the next link:
https://drive.google.com/file/d/1U_8wwaNEmiBviG1N5tyWofSSwVAvCh0L/view

3.3.2 “Recommendations and consideration for the assessment of recreational noise-induced hearing loss.”

Figure 3-9 presentation of Ms Natalia Gilbert

Ms Gilbert shows the auditory effects and non-auditory effects due to exposure noise. Also, she explains where the hearing damage due to noise exposure occurs.

Regarding the assessment of recreational noise-induced hearing loss, she comments that traditionally, the technique used to monitoring hearing damage from noise exposure has been tonal audiometry, considering as one of the primary evidence criteria for this damage, the permanent threshold shift with respect to baseline audiometry.

Unfortunately, the early stages of hearing loss are difficult to measure using this method in adolescents, because early damage to structures may not show up on an audiogram. This should be considered if we want to assess the harmful effects of recreational noise on hearing sensitivity.

Also, comments some research from Kujawa and Liberman in animals models about permanent loss of auditory nerve fibres due to acoustic overexposure, and its possible influence on the assessment of noise hearing damage.

Furthermore, she shows the challenges to assessing the harmful effects of recreational noise on hearing sensitivity indicated by WHO' review on "Current Practices in the Assessment of Recreational Noise-Induced Hearing Loss". In this document, WHO indicated the need for a universal assessment protocol with a uniform methodology for the study of this area to allow for better comparison across studies.

Then, she indicates that maybe the use of a quality assessment and management system would allow the generation of protocols and procedures under the same guideline and base, aiming to control the influence of the variables that could influence the results obtained from the measurements carried out, in order to ensure the validity of the reported results in the measurements.

She shares information about the quality assessment program on audiometric centres in Chile for the occupational area, the PEECCA. She comments that this program allowed to create in Chile a standard to assess noise-induced hearing loss among audiometric centres and lower the rate of inconclusive cases.

To conclude, she indicates that the challenge ahead is the implementation of knowledge to create standardized protocols that allow the implementation of or be included in young population hearing conservation programs, which consider damage from exposure to recreational noise, **under an adequate quality management system**, according to with the conditions and objectives of the respective program.

Also, **It is essential to take as a reference what is expressed in the WHO world report on the hearing, published this year as a recommendation for the development and implementation of school hearing conservation programs.**

To read the abstract of Ms Gilbert presentation, enter at:
https://revista.ispch.gob.cl/index.php/RISP/article/view/120/132

To acces the complete presentation, you can visit the next link:
https://drive.google.com/file/d/1uK6TPTLIAru2EwgQKIwe2PQ57utEcUSu/view

3.3.3 “Music and risk in an existential and gendered world- A current societal challenge.”

Figure 3-10 presentation of Dra Margareta Bohlin

Dra Bohlin begins her presentation by talking about the complexity of risk research among Children and youth.

She highlights that **to understand the young motivation to running the risks, we have to into account many perspectives, as the individual perspective, cultural perspectives, Social and discursive perspectives and existential perspective.**

Dra Bohlin explains the challenges for young people to see the risk in loud music, due to characteristics own of youth period by rapid change, lifestyle, their beliefs and the music meaning or role played by for their lives.

Dra Bohlin shares her knowledge and learning through their studies. She comments that young people that judge a situation to be risky engage less, however, this was not the case for hearing risk judgement and behaviour.

Dra Bohlin, indicate that regarding gender in their studies, they found that young women judge risky activities as more dangerous than men, however, young women participate in activities to the same extent as men, including in Hearing risks. Young men have lower risk perception, more positive attitudes, norms and ideals regarding loud music than young women. However, gender did not explain protective behaviour.

To explain these findings related to the judgment of different risks and gender, Dra Bohlin and their colleagues did qualitative studies, where they found that both genders describe risk-taking to be a part of their existential and social identity, however in different ways, which may explain the previous results. **The finding most highlight for Dr Bohlin was that they learned to listen to the voice of youth in this issue.**

Furthermore, Dra Bohlin comments that a safe and emotionally close parent-child relationship enables open communication between parents and their teenager and this is according to their study linked to reduced risk behaviours over the years.

We know that young people identity and risk-taking change over time and space and in relation to social change. Young people are socially active affected by and face the social context. Identity development is an going lifelong process, the identity is tested at various venues, in relation to the significant other and a different context. From an existential perspective, people are seeking beings that exist in the real world in which they take an active part and are aware of the big question is what it means to live in the special psychological social cultural and historical context.

Also, Dra Bohlin comments about their investigations on risk discourse as seen in different kinds of media. She indicates that media has the best influence on young people because we are constructed from self experiences, but also through the different public discourses. For adolescents, in particular, contact with the media affect their lives in the development of their identity and behaviour.

She shared their study of Swedish tabloids, where risky activities in different context and situations are described, discussed and debate.

To read the abstract of Ms Bohlin presentation, enter at:
https://revista.ispch.gob.cl/index.php/RISP/article/view/121/133

To acces the complete presentation, you can visit the next link:
https://drive.google.com/file/d/1zvh_N4I3ft1Hoo99t8nAyuh8B2OWFclM/view

3.3.4 "Initiatives in Chile to decrease the noise exposure in young people."

Figure 3-11 presentation of MD Natalia Tamblay

Dra Tamblay began by introducing epidemiology data about age distribution on the population of Chile. Also, she shares some studies about the epidemiology of noise exposure in Chile.

She shows the noise map from the Ministery of Environment about the measurement of noise in Santiago of Chile, which shows that the noise in this city is high, especially too close to the road.

She mentioned that Chile has adopted the life course approach for hearing care, and there recognises that exposure to noise is a factor that causes hearing loss throughout life and it is cumulative.

MD Tamblay indicated that in November 2019 was carried out a meeting organized by the Ministry of Health with experts in hearing health to identify the most important problems related to hearing health in Chile, as well as required actions to solve them.

The Hearing Health Plan of Chile have six strategic lines.

Into the actions carried out, MD Tamblay points to awareness campaigns on World Hearing Day promoted by WHO.

MD Tamblay indicated that they are now working on the research on environmental noise in the classroom of professional institutes, however, due to COVID, they had to postpone it.

The next action identified are the technical guideline for environmental noise reduction, new campaigns for awareness, increase the oversight of noisy places and promote the reporting of these and certification of security elements.

As conclusions, MD Tamablay highlight that **a multidisciplinary plan allows a long-term view, developing several activities for the achievement of common objectives, furthermore a monitoring and evaluation process also is required to ensure the correct implementation of the designed initiatives, and the calculation of indicators to measure its impact.**

To read the abstract of Ms Tamblay presentation, enter at:
https://revista.ispch.gob.cl/index.php/RISP/article/view/128/145

3.3.5 "U.S. Centers for Disease Control and Prevention Addresses Hearing Damage from Recreational Noise."

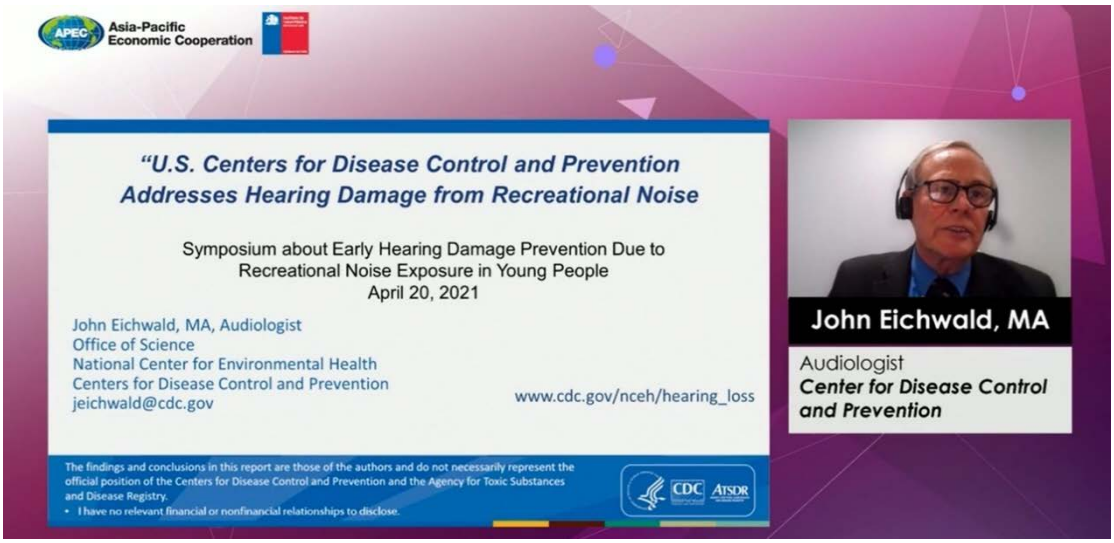


Figure 3-12 presentation of Mr John Eichwald

Dr Eichwald started his presentation indicated that currently, in the United States, there's no remain federal regulations regarding exposure to recreational noise. Then he shared about U.S. Noise Exposure Levels, where he indicated that today there's a scattered mixture of state and local ordinances across the United States that may include various sound level standards based on decibels and on new sensor audibility.

Dr Eichwald comments that the CDC workgroup established a vision to provide data in education increase awareness and prevent noise-related hearing loss at home and in the community and he showed a lot of examples of these materials and activities, like the use of media as the primary method for distribution scientific public health information recommendation through the publication of MMWR – Vital Signs. He highlights that all material in the MMWR series are in the public domain and may be used and reprinted without special permission.

Dr Eichwlad indicated that they recommend for the healthcare provider and the general public the next ideas:

Healthcare providers can: • Ask patients about exposure to loud noise and trouble hearing and examine hearing as part of routine care • Provide hearing tests when patients show or report hearing problems or refer them to a hearing specialist • Explain how noise exposure can permanently damage hearing • Counsel patients on how to protect hearing
Everyone can: • Avoid noisy places whenever possible • Use earplugs, protective earmuffs, noise-cancelling headphones when near loud noises • Keep the volume down when watching TV, listening to music, and using earbuds or headphones • Ask your doctor for a hearing checkup and how to protect your hearing from noise

Furthermore, He shared his experiences in activities made for Hearing World day promoted by WHO.

He comments that in 2018 they used of engagement metric in social media, which allowed them to count how many times your content was displayed to a user. With this, they determined that the message of their hearing campaign had the potential to reach nearly two and a half million people across the globe in 15 days.

Furthermore, he indicated about held a live one hour webcast of a CDC Public Health Grand Rounds besides a presentation on their workgroup activities related to recreational noise, with the participation of expert from Dangerous Decibels, NIOSH and WHO. After these Public Health Grants, They published another MMWR promoting awareness about the problem it's causes, prevention strategies and Public Health Solutions (www.cdc.gov/grand-rounds/pp/2017/20170620-hearing-health.html)

In 2019, they focus on fans of professional sporting events and published full-page public service announcements in the program books for American football, basketball, hockey as well as car in Formula 1 racing.

He indicated that their research conducted on the messaging strategies on how to prevent noise-induced hearing loss among teenagers recommended that They use a variety of social media platforms and use videos are animated gifs. With this in mind, in 2019 they launched animated videos about recreational noise levels and how to wear soft foam earplugs using the roll pull and hold technique. Also in 2020 in recognition of the fireworks safety month, they again launch the video on YouTube regarding the risk from impulsive nature fireworks this video had over 18,000 views across YouTube and Twitter.

Another type of media to promoted and educated that Dr Eichwald shared is an art 10-page steampunk theme graphic novel comic book entitled "how loud is too loud". This was created in collaboration with CDC's healthy school's program and was designed to increase young people's knowledge about hearing Anatomy noise-induced hearing loss and prevention in teenagers. Dr Eichwald comments that currently comic book was wide redistributed with a School Educational magazine.

Dr Eichwald spoke about of results of the survey of Teen Noise Exposure and Efforts to Protect Hearing at School in the United States in 2020. The findings emphasized the need for an increased Public Health focuses on raising awareness about the adverse effects of loud sounds, sound environment, sound on hearing health as well as the importance of protective measures from noise sources in school.

Also, he comments that this year they are using digital with public service announcements for the Super Bowl, the Daytona 500 stock car race and targeting new audiences with the college football championship and 26 major league soccer US.

Finally, He shared some of their federal partner resources: The NIOSH sound level meter app and the Noisy Planet website. Also, he refers to their hearing loss tool kit that has information for the public. It has fact sheets and posters infographics and media. All the materials are provided in the toolkit that he mentioned that are freely downloadable for use in the same many are in English and Spanish.

To read the abstract of Mrs Eichwald presentation, enter at:
https://revista.ispch.gob.cl/index.php/RISP/article/view/122/134

To acces the complete presentation, you can visit the next link:
https://drive.google.com/file/d/1eV9J4XQ1RyadiWwN7dkD-k4kDe8XNNBc/view

3.3.6 "Applying the Hierarchy of Hazard Control to Regulation of Sound Levels in Entertainment Venues."

Figure 3-13 presentation of Dr Johannes Mulder

Dr Mulder begins his presentation indicated that, in principle, the same risk management approach in workplaces can be applied to entertainment venues. Also, he indicated that his presentation is based on an earlier publication[4].

In his presentation, Dr Mulder showed a table (figure 3-14) where compared differents examples of existing policies and regulations in entertainment venues. This table includes:

• Specified Sound Level Limits, divided into the upper limit, additional limit, peak limit, and lower limit for <18 years.

• Other protective measures include the provision of warnings (at the venue, on tickets and marketing materials), provision of earplugs (free or at low cost), ensured attendees can access quiet zones or rest areas and restricting audience access to loudspeakers.

[4] Beach EF, Cowan R, Mulder J, O'Brien I. Applying the hierarchy of hazard control to regulation of sound levels in entertainment venues. *Ann Work Expo Heal*. 2020;64(4):342-349. doi:10.1093/ANNWEH/WXAA018

Table 1. Guidelines, regulations, and legislation that aim to protect attendees' hearing in entertainment venues—sound level limits (T = duration of event).

Country/region/ city/state	Reference	Specified sound level limits				Other protective measures					
		Upper limit	Additional limit	Peak limit	Lower limit for <18 years	Provide warnings	Display level to operator/ audience	Retain sound level data	Provide hearing protection	Provide access to rest area	Restrict access to speakers
Switzerland[a]	Cercle Bruit (2018), Swiss Confederation (2012)	100 dB $L_{Aeq,60min}$		<125 dB L_{Fast}	✔	✔		✔	✔	✔	
Netherlands[b]	Vereniging Nederlandse Poppodia en Festivals *et al.* (2018)	103 dB $L_{Aeq,15min}$		<140 dB $L_{C,peak}$	✔	✔		✔	✔		
Belgium—Flanders[a]	Departement Leefmilieu Natuur en Energie (2016), Flemish Government (2013)	100 dB $L_{Aeq,60min}$	102 dB $L_{Aeq,15min}$				✔		✔		
Belgium—Brussels[a]	Government of the Brussels-Capital Region (2017), Leefmilieu Brussel (2017)	100 dB $L_{Aeq,60min}$	102 dB $L_{Aeq,15min}$			✔	✔	✔	✔	✔	
Germany[b]	Deutsches Institut für Normung (2007)	99 dB $L_{Aeq,30min}$		<135 dB $L_{C,peak}$		✔	✔		✔		
France[a]	République Française (2017)	102 dB $L_{Aeq,15min}$	118 dB $L_{Ceq,15min}$		✔	✔	✔	✔	✔	✔	
Norway[b]	Norway (2011)	99 dB $L_{Aeq,30min}$		<130 dB $L_{C,peak}$					✔		
Austria[a]	Republic of Austria (2011)	100 dB $L_{Aeq,1min}$				✔			✔		✔
Sweden[a]	Sweden (2005)	100 dB $L_{Aeq,T}$	115 dB L_{AFmax}		✔						
Czech Republic[a]	Czech Republic (2011)	100 dB $L_{Aeq,4h}$									
Italy[a]	Agenzia Nazionale per la Protezione dell'Ambiente (2001), Presidente del Consiglio dei Ministri (1999)	95 dB L_{Aeq}	102 dB L_{Amax}								
United Kingdom[b]	Health and Safety Executive	107 dB $L_{Aeq,T}$		<140 dB $L_{C,peak}$		✔					✔
Mexico[a]	United Mexican States (2013)	100 dB $L_{A,4h}$									
Nicaragua[a]	Republic of Nicaragua (2005)	110 dB L_{Amax}									
Delaware—USA[a]	State of Delaware (1982)					✔					
Minneapolis—USA[a]	City of Minneapolis (2014)								✔		
San Francisco—USA[a]	City and County of San Francisco (2002)								✔		
Trinidad and Tobago[a]	Republic of Trinidad and Tobago (2000)					✔					

[a]Legally binding documents, i.e. laws, decrees, codes, regulations, or ordinances issued at the federal, state, or local level.
[b]Non-legally binding documents, i.e. recommendations, standards, or covenants.

Figure 3-14 Tablet with guidelines, regulations and legislation from Annals of Work Exposures and Health, 2020, Vol. 64, No. 4, 342–349. doi: 10.1093/annweh/wxaa018.

Dr Mulder, toke as an example a Switzerland, where they have experience from 1996 in this kind of regulations. Its regulation is based around a maximum of 100 dB Leq, 60 minutes, and they established three categories:

- All events where there are under 16-years-olds the level is LAeq, 60 < 93dB
- LAeq, 60 between 93dB and 96dB
- LAeq, 60 between 96 and 100dB

If the **event has Leq,60 between 96 and 100dB** and it has **fewer than three hours**, is required notices are prominently displayed at the entrance to the event, informing the audience of;

- The particular sound level,
- The risk of hearing damage associated with high sound levels, which increases with the period of exposure
- Hearing protectors are complying with SN EN 352-2:20028 are available free of charge.
- The hourly level is monitored during the event with a sound level meter.

If the **event is from 96 and 100dB**, but **for more than three hours**; we need additional requirements such as;

- Sound levels are recorded throughout the event
- The sound level recording data and details of the measurement position are retained for 30 days and submitted to the enforcement authority on request
- Respite area is available for the audience, with notices to this effect being prominently displayed at the entrance.
- Particular requirements for rest areas also set out;
  - The hourly level must not exceed 85 dB LAeq.

- The area must make up at least 10% of the total area provided for the audience, and
- The area must be clearly marked and readily accessible to members of the audience.

Another example is The Netherlands, where it is not a law; it is a covenant between the largest stakeholders.

Sound level emissions do not exceed the following limits, according age group:
- Children up to and including the age of 13: LAeq,15min 91 dB;
- Children/adolescents aged 14 and 15: LAeq,15min < 96 dB;
- Children/young people aged 16 and 17; LAeq,15min < 100 dB;
- Multi-age/people aged 18 years and older: LAeq,15min < 103 dB.
- Peak levels are limited to LCPeak < 140 dB.

Also, depending on the age of the audience, hearing protection is recommended when sound levels exceed the limits set out below:
- For events at which the target audience is children and young people aged up to 18 years: 88 dB LAeq,15min;
- For multi-age events and audiences aged 18 and over: 92.5 dB LAeq,15min.

The literature recommends an appropriate limit for recreational exposure of 83 dB LAeq,8h[5]. However, 83 dB LAeq,8h is well below the values found in the regulation cited on the APEC Economies and non-APEC Economies. Most of this list of regulations requires that venues substitute current levels with sound level limits that do not exceed 100 dB LAeq (figure 3-14). This level likely to meet the socio-cultural expectations of audiences and performers and meet the preference of many audience members. However, it is not a safe level.

For Example, the Netherlands. Where established upper limit like 100dB, indicated this: *'The parties to the agreement realize that the [prescribed] noise levels...are not absolutely safe for every individual. Hearing damage can occur under the recommended sound level... Therefore, the parties to the covenant regard it as important to inform visitors and professionals how to reduce the risk of hearing damage.'*

The measures indicated in the table (figure 3-14) could be classified from most to least effective considering the hierarchy of hazard controls. The hierarchy of control is a set of approaches to reduce risks in the workplace and entertainment venues. They go from the strongest to weakest measure; Elimination, Substitution, Engineering Control, Administrative control, and Personal Protection Element (PPE).

The control hierarchy is to maximize the number of people you can protect by the risk control measure. In general, it's better to use a risk control measure that will protect everyone who could be exposed to the hazard, rather than relying on individuals to provide their protection. So, for example, it is better to put a soundproof enclosure around a noisy machine than to expect everyone who might be exposed to the machine's noise to wear hearing protection.

For recreational setting, the first element on the pyramid of hierarchy control is **substitutions**. For example, requering that venues substitute level that does not exceed 100 dB.

[5] Neitzel, R.; Fligor B. DETERMINATION OF RISK Make Listening Safe ,. *World Heal Organ*. 2017;6(6).

The next step in the hierarchy is the **engineering controls**, which include restricted access to loudspeakers to avoid people coming to get too close to loudspeakers, where sound levels are the highest and the most dangerous—also, provision of access to quiet respite areas.

The **administrative controls** consider the provision of warnings flagging beforehand that sound waves will be dangerously high when you go to any event in the entertainment venue (Eg on tickets or posters), real-time display of sound levels in the place.

And finally, provision of **earplugs**.

To concluded, Dr Mulder indicated that managing the risk of hearing damage for audience members attending entertainment venues is a complex issue that involves a range of stakeholders.
Regulations alone are not enough to eliminate the risk to hearing health; entertainment venues must be part of a larger solution.

If entertainment venues become more regulated, hearing-related measures, such as reduced sound levels, regular earplug use, and access to respite areas will start to become ‘normalized’. As regulation becomes more widespread and the number of compliant venues increases, hearing-health practices should become more common.

The benefits will be observed not only in individual venues but in the creation of new norms, in which hearing-protective behaviours become an acceptable practice.

In time, these new norms could become powerful motivators to encourage: behavioural change and a cultural shift towards entertainment venues that value and protect the hearing of all who enter them.

To read the abstract of Mrs Mulder presentation, enter at:
https://revista.ispch.gob.cl/index.php/RISP/article/view/124/135

To acces the complete presentation, you can visit the next link:
https://drive.google.com/file/d/1TaHpwcsyS2DxzYEH2m_rnYibWFl09kOZ/view

3.3.7 "Best Practices on public policies against hearing damage in young people promoted by WHO and ITU."

Figure 3-15 presentation of Mr Mark Laureyns

Dr Laureyns explained that the "Make Listening Safe Workgroup" is from the world hearing forum of WHO, which has one important ambition to create a world where nobody's hearing is put in danger due to unsafe listening.

Also, he commented that one of the first objectives they have in the workgroup is to increase awareness of the importance of safe listening and change behaviour for young people. He highlighted that it is a big challenge because changing behaviour is not easy, but we shouldn't rest, we should do it.

The first part of the presentation was focus on devices and systems. Where he talked about ITU and WHO safe listening standard.

The WHO / ITU-T H-870 Standard have the logic of the equal energy equivalence principle. So what does mean? If you listen to music at the level of 80 dB for 40 hours that is considered safe. Now, every time that you increase the level by three dB, it means doubling the energy. So if you switch with double the energy now you should only listen for 20 hours to that level of sound or that level of music. And so we can go on so every time you see the 3dB be increased we see that will be cut the hours of safe use, resulting in the fact that if you listen to 101 dB SPL you can only listen for 18.8 minutes or 170 dB(A) you can only listen for 4.5 minutes.

Then, rolling accumulation of those exposures over 7 days is used, so it means that the smart devices or wherever you listening to is constantly monitoring the level that is entering the ear, and they will look into what is the overall dose/exposures that who hearing had over the period of seven days.

Mr Laureyns comments that manufacturers of Smartphones started to implement the standard, but **now is necessary to make sure young people know about it and activate this on their devices.**

Dr Laureyns explained two examples, in the first the calculated weekly dose was 51% of your dose, which mean all is fine. In the second example**, the calculate of the**

weekly dose was 120% approx, with this you will get information to be careful, what is meant by safe listening, the risk of unsafe listening, the device's safe listening features, and how to use them directly in your smartphone.

Mr Laureyns highlighted that this standard is about ensuring that you can listen for a long time, that we make sure that you don't ruin your ears and enjoy your music today but those too in the future.

The IEC 62368-1 standard is also looking at the same. It talks about smart devices; they talk about personal music players and ensure that you can listen safely. Also, this Standard includes the energy equivalence principle and have a Dose-based warning and automatic decrease.

The European Commission Directive has already made this specific, and the commission decision has already been published in 2009, where they clearly state that;

1.Exposure to sound levels shall be time-limited to avoid hearing damage. At 80 dB(A), exposure time shall be limited to 40 hours/week, whereas at 89 dB(A), exposure time shall be limited to 5 hours/week. For other exposure levels, linear intra- and extrapolation apply. Account shall be taken of the dynamic range of sound and the reasonably foreseeable use of the products.

2.Personal music players shall provide adequate warnings on the risks involved in using the device and the ways of avoiding them and information to users in cases where exposure poses a risk of hearing damage.

In part 2, he talked about recommendations for entertainment venues and use earplugs.

Mr Laureyns showed some maximums sound level limit indicated in a publication from the World Health Organization ("Regulation for control of sound exposure in entertainment venues"). All these guidelines clarify that you need to stay under a certain level based on what is acceptable for these venues.

In those regulations, the highest accepted level has 102 dBA for 15 minutes. So, based on the energy equivalence principle, after 18,8 minutes (or 6 minutes for sensitive users) at 101dBA exposure, you would have used your total weekly accepted exposure. And most concerts last longer than 18 minutes.

That is probably not reasonable, and for that reason, **these regulations also state that all the venues should provide free hearing protection of charge to ensure that audience can be safe.**

The issue is that although it is mandatory to provide hearing protection and earplugs, it is not mandatory to use them.

He showed studies about using earplugs in Entertainment Venues, the results evidence that many people don't use earplugs. The Arguments used for not protecting their ears were; I will not understand anybody, Hearing protection is uncomfortable, and it doesn't fit, It will result in poor sound quality, and I didn’t bring them.

Mr Laureyns shared his study that looking into all these arguments and evaluating the impact of hearing protection on those levels.

Concerning the argument that I will not understand anybody. The results indicated that you understand as good or even better with protected ears.
About the argument that they are uncomfortable, they don't fit. The study founded that custom protection or protection with filters is very comfortable.

With regard to the argument that they result in poor sound quality. The results indicated that use protection with music filters the perception in the sound quality of music is perceived much better.

With regard to the argument that I didn't bring them. The study indicated that offered free of charge at many festivals, but maybe it's better to have your own reusable hearing protection set and result in better quality.

In conclusion, Mr Laureyns noted that **if you want young people to use earplugs and change their behaviour, handing out free foam disposable earplugs may not be the best idea.**

We should find a solution to make a way or solutions to reusable earplugs with music filters accessible by coupons, for example. Because that will change behaviour, and that makes the perception of the use of earplugs much more positive.

To read the abstract of Mrs Laureyns presentation, enter at:
https://revista.ispch.gob.cl/index.php/RISP/article/view/123/136

To acces the complete presentation, you can visit the next link:
https://drive.google.com/file/d/16dOR1tDqEubuLFnq9yjsRSqxvZJ7lcDm/view

3.3.8 "Experience and recommendations on improving hearing health awareness through education."

Figure 3-16 presentation of Dra Nashrah Maamor

The population of Malaysia as of the year 2020 was 32.7 million, and the percentage of youth between the ages of 15 to 20 years old is 24.6%, with a great number of male compared to females for his age group.

Urbanization in Malaysia was 76.6%, and this is considering the most urbanized Economy in Asia.

Dra Nashra shared the potentially dangerous activities and the frequency of exposure from 712 students from the age of 13 to 17 years.

Most students reported using headphones. Another type of activity that they also reported doing often is riding motorcycles, putting loud music when they're riding their cars, using loud tools and play musical instruments. Other activities that they do, probably not much is going to the cinema, setting off firecrackers in our events, going to the arcade, which we see a lot in shopping malls in Malaysia, the loud sports events, going to karaoke or sing along and cybercafe, going to a fitness gym and loud concert.

She shared the make listening safe effort in Malaysia (Dangerous Decibels activities). This program started in 2016 with the certification of five educators at faculty members in NUS.

During the same years, in 2016, they received funding to develop a program that uses education.

With this funding, they conducted research to learn more about Malaysia's scenario and adapt "dangerous decibels program" for schoolchildren, workers, and musicians. They looked to make it be more linguistically and culturally appropriate.

From 2017 annually until 2019, they conducted of Dangerous Decibels Educator Workshop.

In 2019, with the support of 3M, they extended the program for the worker.
Now they are looking into regulation and policies; they are very actively looking for discussions and approaching policymakers and regulators bodies.

Then, she shared her investigation of the effectiveness of the Dangerous Decibels program among primary and secondary school students in Malaysia. They measured the knowledge, attitude and intended Behavior at three different time points. The program that they developed can motivate children about hearing health and improve their attitude and behaviour.

Dra Nashra indicated that **the recommendation is to start early to create a culture that promotes safe listening.** They seem that the best way to do it is to Target the education system.

Regarding the education system, Dra Nashra comments that they have looked at the curriculum of Malaysian Public Schools. They reviewed 100 textbooks across the years from U1 to U11 and look for hearing information. They found students' books talked about concepts, sounds, hearing but not so much about hearing care, nothing about tinnitus or properly protecting their ears.

To finished her presentation, Dra Nahsra indicated that their recommendations are:
- Develop hearing health educational standards **- Improve hearing health information in the existing curriculum (Use relevant examples and give clear instructions on ways to protect hearing)** **- Conduct annual hearing health programs** **- Consider input from teachers and school administrators**

To read the abstract of Dra Nashra presentation, enter at:
https://revista.ispch.gob.cl/index.php/RISP/article/view/125/142

To acces the complete presentation, you can visit the next link:
https://drive.google.com/file/d/1Tavy1Y20DfqboLZL3uWSWyQbKh4TYbZ0/view

3.3.9 "National Ear and Hearing Care in Malaysia."

Figure 3-17 presentation of Dr Izny Hafiz Zainon

Dr Izny Zainon spoke about the development of Ear and Hearing Care (NEHC) in Malaysia.

Following the WHO Development of Health Assembly resolution and action plan to prevent deafness and hearing loss resolution in 2016, the Malaysian Ministry of Health under the Medical Development Divison took the initiative to develop the Ear and Hearing Care (NEHC) program in Malaysia.

The expectation from the EHC programme is to reduce the risk of leading to hearing loss, prevent complication and further deterioration, improve outcome and functional level, avoid financial risk due to cost of care and ensure equitable spread of improved outcomes (leave no one behind).

NEHC comprises the multidisciplinary involvement of all stakeholders in managing ear and hearing care in Malaysia. The committee comprises the Ministry of Health, Ministry of Education, Ministry of Human Resources, Ministry of woman, family and community development, NGOs related to EHC and the private sector (Hearing Aida and Hearing implant supplier).

They started their first meeting on a world hearing day in 2018. This first meeting in Langkawi was to discuss the assessment of the Malaysia's situation regarding EHC and form the first step in developing a strategy that included multidisciplinary cooperation between all stakeholders.

LANGKAWI EHC resolution 2018 have three general statements:
GS1 - Awareness: Reaffirming all citizen the importance of ear and hearing care across ages.
GS2 - Financial: Stressing the fact that ear and hearing care faces significant financial obstacles and needs reform, particularly detection, intervention and management.
GS3 - Workforce: Emphasizing the collaboration among relevant agencies better to enhance the coordination in the ear and hearing care

In the Cherating NEHC meeting held in 2019, They discuss more the advocacy, legislation, law, Technical involved in voluntary training, and the finance, budget, procurement, and supplies and logistics to create a more cost-effective strategy in hearing care.

The current implementation of NEHC in Malaysia are emphasizing on early detection & intervention, Hearing screening, Hearing aid & hearing implant procurement; zero reject policy for students with special needs by the Ministry of Education, majority of hearing care industries contribute 5% of activities to community service by providing hearing screening and hearing aid, and training of EHC personnel.

In conclusion, multidisciplinary cooperation between all stakeholders is needed to improve Ear & Hearing Care in Malaysia, improve efficiency, reduce the cost for the more cost-effective, and leave no one behind.

To finished his presentation, Dr Izny Zainon indicated that the **future challenges and recommendations are**:
Policy - EHC services at state, major, minor, university hospitals and institutions - Human resource for universal screening - Guidelines /SOP to encompass university and private hospitals for newborn hearing screening - Zero Reject Policy –to assist reasonable accommodation (to include HA, FM system and loop) for hearing impaired - Lack of implementation of control measures by employers (New Regulation 2019)
Equipment - Issues of non-streamline equipment procurement (expensive disposable and maintenance)
Awareness

To read the abstract of Dr Izny Hafiz Zainon presentation, enter at:
https://revista.ispch.gob.cl/index.php/RISP/article/view/127/144

To acces the complete presentation, you can visit the next link:
https://drive.google.com/file/d/1m_f3V-YGg0hRJ43zyjIGu21so7K0mNgE/view

3.3.10 "World Report on Hearing Recommendations for Prevention of Hearing Damage in Recreational Settings."

Figure 3-18 presentation of Prof. George Tavartkiladze

Prof. George remarks that on 3 March 2021, the World Report on Hearing of WHO was launched.[6]

His presentation is about the information on this report.

He remarked the recommendations indicated in the World Report on Hearing from WHO about protective and preventive factors, limitation exposure to damaging levels of sound and the effectiveness of noise reduction measures, to protected hearing from noise exposure and minimizing noise as a causative factor for hearing loss.

He comments on recommendations from WHO, such:

- Keeping noise volumes down
- Protecting ears in noisy situations
- Minimizing the time spent in noisy environments
- Monitoring personal sound exposure
- Safe listening practice in recreational settings
- Noise control in entertainment venues
- Raised awareness and policy measures can prevent hearing damage during work and leisure.

To read the abstract of Prof Tavartkiladze presentation, enter at:
https://revista.ispch.gob.cl/index.php/RISP/article/view/126/143

[6] World Health Organization. *World Report on Hearing*.; 2021. https://www.who.int/publications/i/item/world-report-on-hearing

3.3.11 Questions and answers

Q1. As part of avoiding monotony to those workers with repetitive work, are allow to use headphone to listen music from their phone, but I wonder which will be the maximum volume permitted without been hazardous?
In the US, workers are discouraged from using their personal headphones to listen to music if they work in noisy jobs, since the headphones add additionally unmeasured exposure to the noisy work environment and may put the workers at additional risk of noise-induced hearing loss. One solution to this is to have workers wear earmuffs with electronic amplification that can connect to the worker's personal listening device (see, for example, https://www.amazon.com/3M-WorkTunes-Protector-Bluetooth-Technology/dp/B0723CYHPZ/ref=asc_df_B0723CYHPZ/?tag=hyprod-20&linkCode=df0&hvadid=312154679201&hvpos=&hvnetw=g&hvrand=10180317206420726287&hvpone=&hvptwo=&hvqmt=&hvdev=c&hvdvcmdl=&hvlocint=&hvlocphy=9016851&hvtargid=pla-434189531700&psc=1).
These earmuffs are designed to not permit exposures over 82 dBA, so workers can listen to their music and their employers can be confident that the workers are being protected from ambient noise and not being overexposed to their music from an occupational noise exposure perspective (since most occupational limits are an 8-hour average of 85 dBA). In terms of a safe listening level for recreational sound, including music, the World Health Organization has adopted a weekly 80 dBA average listening level over 40 listening hours.

Q2. Regarding the Apple study, is it extrapolatable to other electronic devices?
Due to the wide variety of designs and manufacturers of non-Apple smart phones (e.g., Android, Windows, etc), there is no way to standardize measurements across those different phone models. For Apple products, there is standardization in microphones and operating systems, which allows for the Apple Hearing Study to collect consistent and comparable measurements across users. I am not aware of any studies of noise exposure or hearing loss that are being conducted using non-Apple phones because of these issues. It is difficult to know the extent to which Apple Hearing study results are generalizable to users of other phones. There may be important differences in demographics and other factors between Apple and non-Apple users. However, to the extent that smart phone users are all broadly similar, the results of the Apple Hearing Study should be generalizable to non-Apple users.

Q3. Does the apple study indicate some exposure levels from entertainment noise?
The Apple Hearing Study is collecting information from Apple Watch users participating in the study about their ambient exposures. Based on survey data we know the typical work and sleep hours for participants, and so we can analyze exposures during their non-work, non-sleep hours, which will include entertainment. We are not collecting information about specific entertainment activities (i.e., going to a club, restaurant, movie theater, etc) but will be able to estimate at a high-level typical exposure during non-work, non-sleep hours.

Q4. Do you know if there's any legal limits or protocols for headset or "talkers" used in warehouses where you do pick and packing of products? In my experience in Australia, those systems are very loud and I don't know how they make decisions about the max volume permitted.
I am not aware of any legal limits for headsets or talkers as you describe, either in the US or Australia. However, one solution to this is to have workers wear earmuffs with electronic amplification that can connect to the worker's personal listening device (see, for example, https://www.amazon.com/3M-WorkTunes-Protector-Bluetooth-Technology/dp/B0723CYHPZ/ref=asc_df_B0723CYHPZ/?tag=hyprod-

20&linkCode=df0&hvadid=312154679201&hvpos=&hvnetw=g&hvrand=1018031720
6420726287&hvpone=&hvptwo=&hvqmt=&hvdev=c&hvdvcmdl=&hvlocint=&hvlocphy
=9016851&hvtargid=pla-434189531700&psc=1).These earmuffs are designed to not permit exposures over 82 dBA, so workers can listen to their music and their employers can be confident that the workers are being protected from ambient noise and not being overexposed to their music from an occupational noise exposure perspective (since most occupational limits are an 8-hour average of 85 dBA). Some of these earmuffs also have a jack into which a work radio can be connected, which would allow for two-way communication. In terms of a safe listening level for recreational sound, including music, the World Health Organization has adopted a weekly 80 dBA average listening level over 40 listening hours.

Q.5 Is there any noise limit/ is there any regulator to regulate the noise at fitness studio/ gym, etc.?

I am not aware of any regulatory noise limits in the US or elsewhere that are specific to fitness studios or gyms. In theory, employees of these facilities in the US should fall under the Occupational Safety and Health Administration's 90 dBA 8-hour Permissible Exposure Limit for noise, but in practice I do not believe that OSHA has or plans to enforce this limit in fitness studios or gyms.

Q.6 Are there any government laws that have been successful in preventing acoustic damage in teenage population?

I am not aware of any US government laws that have been successful in preventing hearing loss among teenagers, with the exception of the US Occupational Safety and Health Administration's Hearing Conservation regulation, which applies to all noise-exposed workers, including teenagers. However, this regulation focuses solely on workplace noise, and not on recreational noise.

Q.7 How do you measure noise exposure in people that work with headsets such as phone operators, or teleworking? My concern is in the evaluation of workers with potential occupational noise damage.

Measuring noise exposures among phone operators or teleworkers is challenging. If these workers are using their phone in speakerphone mode, and they have an Apple Watch, they could monitor their own exposures use the Noise App on the watch. However, if they are using a headset, measurements are complicated and require very specialized equipment. Employees should be instructed to operate their headsets at the lowest possible volume, and providing employees with headsets that cover both ears may allow them to listen at lower levels by reducing ambient noise from their surroundings.

Q.8 Which are the cities with higher noise intensity in the US?

A very good resource is the U.S. Department of Transportation (USDOT) Transportation Atlas Database (NTAD) and Transportation Noise Mapping Tool (NTNMT) which produces noise inventory layers for aviation and roadway transportation sources. This dataset uses a 24-hr equivalent A-weighted sound level (LAeq) noise metric. Data within the Transportation Noise Map represent potential noise levels across the United States for an average annual day for the specified year. Please see their documentation for a full list of acoustic modeling assumptions and note these data are intended to facilitate the tracking of trends in transportation-related noise by mode collectively over time and should not be used to evaluate noise levels in individual location and/or at specific times.

https://www.bts.gov/geospatial/national-transportation-noise-map

Here is a snapshot from their website:

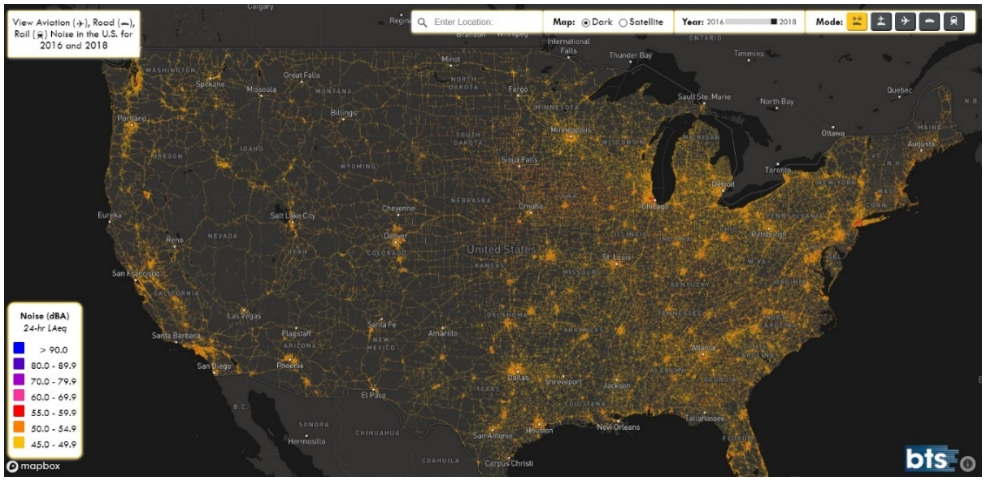


Figure 3-19

Q.9 What tonal audiometry app do you recommend for android smartphones? What sonometer app do you recommend Android smartphones?
In my presentation I mentioned the NIOSH Sound Level Meter (SLM) application which runs on the Apple iOS platform and provides sound level metrics found in most commercial sound level instruments.
https://www.cdc.gov/niosh/topics/noise/app.html NIOSH was able to verify that their app will perform as expected on any iOS device as these devices share common hardware and software architecture that is optimized for audio applications. They report the Android device marketplace is fragmented among many manufacturers with different requirements and specifications for microphones, audio/signal processing chips, and software tools. As a result, testing and verification of the accuracy and functionality of an Android-based app by NIOSH is not currently possible.

Q.10 What hearing rates are specifically damaged by recreational damage? 6 kHz?
In our investigation for the Morbidity and Mortality Weekly Report “Vital Signs: Noise-Induced Hearing Loss Among Adults — United States 2011–2012” we analyzed the audiometric data of 3,583 adults from CDC’s Health and Nutrition Examination Survey. (https://www.cdc.gov/mmwr/volumes/66/wr/pdfs/mm6605e3.pdf).
We defined a noise-induced hearing loss as the presence of a high-frequency audiometric notch when one or more of the thresholds at 3, 4, or 6 kHz exceeds the pure-tone average of the 500 and 1K Hz thresholds by ≥15 dB hearing level (HL), and the 8 kHz threshold is at least 5 dB HL lower (better) than the highest threshold in the 3–6 kHz range.

Q.11 Who is the enforcer of environmental noise in the US?
In 1974, the U.S. Environmental Protections Agency identified an exposure limit for noise in order to protect the health of the nation’s population. However; due to lack of funding in 1982 for that Agency program, the responsibility of environmental noise control was entrusted to state and local governments. Today there is a scattered mixture of state and local ordinances across the United States with varying regulatory definitions, noise control measures, and enforcement authorities

Q.12 How is enforcement undertaken and what are the penalties? What about for occupational noise? who are the enforcers and what are the penalties?
As stated in the response above, there is a scattered mixture of state and local ordinances across the United States with varying regulatory definitions, noise control measures, and enforcement authority. We recently conducted a literature review and environmental scan of 60 randomly chosen small, medium, and large U.S. community

noise ordinances. Among those, two out of three included fines in their ordinances. Civil penalties or infractions were found in over a third. Seven communities had no penalty and no enforcement clauses in their noise codes, two had enforcement but no penalties, six had penalties but no enforcement, and 45 had both written enforcement and penalties. It should be noted that a community noise ordinance might not have penalties or enforcement if a superseding chapter for penalties and enforcement supplants multiple ordinances in the code. Because only ordinances with the word "noise" in the title were reviewed, cross-referenced penalties and enforcement were not identified. One resource we found extremely valuable for noise related regulatory information is the Noise Pollution Clearinghouse which is accessible at www.nonoise.org.

Q.13 What do you think about the idea that invest in speakers with good sound quality, in players, mobiles, speakers at concerts, in the cars - then maybe you do not turn up the volume? There are some studies indicated good sound quality may have a buffering effect (as mentioned). Maybe government subsidy on good sound quality for everyone?

I am not aware of any studies, showing that with poor speakers in players and mobiles, you would lower the volume. In fact, poor speakers, will mostly distort at higher levels, and therefore you are more likely to turn the volume down. For concerts, the design of how the speakers is placed and speakers that spread the sound energy evenly over the whole venue, are indeed a very good idea. This avoids that in some parts of the venue the sound level will be very loud and in other parts much lower.

Q.14 How do those standards that you mentioned work? I mean. Are they applied? Who verifies that they are met?

When manufacturers announce they comply to the standard, the standard institutes can check compliance with the standard. Some places require that products can only be sold, if they comply with specific standards and then the manufacturer needs to certify the standard compliance.

Q.15 Which one is safer between using speakers or earphone in school-aged children? Specially in this era of pandemic where they have to attend online school every day.

I would avoid insert earphones for children, since they can reach much higher sound levels, then you would expect in children's smaller ears. Now, we need also to be aware that learning and memory are negatively influenced by noise in the environment. So, in a quiet room, using a loudspeaker be a very good idea. But if there are multiple noise sources around (other people, radio, television etc.) then is might be better to use supra-aural headphones.

Q.16 If the highest hierarchy is to be followed, eg that someone else removes a threat, is there a risk that the individual forgets his own responsibility and exposes himself to risks they have not thought of? That is, that the individual thinks it is safe because someone else has fixed it and forgets his own responsibility.

In this case, I think elimination of the sound source implies cancelling the concert to avoid hearing damage risks. I do think what will happen next is that people will organize event outside of regulated venues (e.g., illegal raves) which can indeed expose audiences to greater risks. There certainly is also a trade-off between top-down approaches (e.g., the hierarchy of hazard control discussed) and audience members' individual responsibility to look after their hearing (ear plugs, dosage reduction etc.)

Q.17 There are regulations for entertainment venues. But, for zones nearby, where acoustic contamination is probably high, what regulations are there for this?

The examples mention in the presentation are all provision to specifically reduce hearing damage risks. These are in place (at least in the APEC Economies and non-APEC Economies mentioned) on top of existing regulations to reduce nuisance for neighbors and sound pollution. These kinds of rules are much better established and have been around for several decades and are commonplace. Additionally, music venues are covered by Work Place Safety regulations in each Economy, in theory employers have to protect venues staff from the (very common) dangerously high sound levels at concerts, but this has many challenges. One solution is removing bars from the music rooms to at least protect bar staff, but not even this is a requirement in all APEC Economies and Non-APEC Economies.

Q.18 Can you talk about the best strategies for patrons and sound engineers to accept the regulations?

This operates at several levels. On the day of a concert, it is important that there is agreement between all stakeholders about responsibilities to reduce risks. This included, sound engineers, booking agents, venue/band managers but also musicians. For instance, musicians can contribute by reducing the sound level on stage by turning down guitar amps, smaller drum kits, using in-ear, monitors. As a patron, it is hard to have a voice in this debate and not always appreciated (but it's always worth complaining officially and in the meantime protect your ears with hearing protectors). See for instance:

Mulder, J. (2016). Average is the new loudest. Leonardo Music Journal, 56-59.

Mulder, J. (2016). Amplified music and sound level management: A discussion of opportunities and challenges. Journal of the Audio Engineering Society, 64(3), 124-131.

Q.19 How do those standards that you mentioned work? I mean. Are they applied? Who verifies that they are met?

There are many issues with verifying and enforcing sound level limits in music venues, and this is hardly documented. The situation in Flemish Belgium was reviewed in 2018, and one of the problems raised was the need for a specialized officer to witness a measurement for the full 60 minutes that is provided in the regulation.

My presentation at the symposium was part of a series of publications which can provide more information:

Beach, E. F., Mulder, J., O'Brien, I., & Cowan, R. (2020). Overview of laws and regulations aimed at protecting the hearing of patrons within entertainment venues. European Journal of Public Health, 31(1), 227-233. doi:10.1093/eurpub/ckaa149

Beach, E. F., Cowan, R., Mulder, J., & O'Brien, I. (2020). Regulations to reduce risk of hearing damage in concert venues. Bull World Health Organ, 98, 367-369. doi: http://doi.org/10.2471/BLT.19.242404

Q.20 Who enforces occupational and recreational noise in Malaysia?

For occupational noise, that would be the Department of Occupational Safety and Health, Malaysia. There is no regulation yet in place for recreational noise exposure although the updated noise regulation (2019) does not specify that the noise limit in the workplace is specifically for factory or industrial workers.

Q.21 Are there any guidelines that have been developed on occupational & recreational noise in Malaysia?

There are no guidelines yet developed on recreational noise in Malaysia, but for occupational noise we do have quite comprehensive guidelines developed under the noise regulation (2019) Act 1994.

Q.22 What challenges, if any, do you find in running the program for secondary schools as compared to the primary school kids? Do school children of older age groups retain information/ modify their listening behaviors better?
That's a good question! The challenge when running programs at school regardless of whether it's for primary or secondary school kids is in the logistics and in getting teachers and school administrators to support the program. As for conducting the Dangerous Decibels program, to have a more effective session with secondary school students, I do believe that it would be better to have smaller group of students so that we can have better interactions with them. From our experience, secondary school students tend to lose interest more quickly if they were not engaged in the session.

Q.23 Is Employee hearing screening is mandatory in Malaysia at the moment? How frequent? And Any legislation on it?
Employee hearing screening only mandatory in workplace with high-risk noise exposure. Noise risk assessment will be done by Occupational Health Doctor based on employer identification of excessive noise for each area in the workplace. It should be done annually. Legislation based on Malaysian Occupational Safety and Health Act 1994 [Act 514] to comply with the provisions of Occupational Safety and Health (Noise Exposure) Regulations 2019 [P.U. (A) 60/2019] gazette on 1 March 2019.

Q.24 How different APEC Economies and non-APEC Economies handle public nuisance (noise complaint)? Any regulation deal with it?
In Malaysia, police report can be made & the offender can be charge under local council law or legislation under Ministry of Environment if it involved the environmental noise limit.

Q. 25 In my experience it is very difficult that collaborators want to use hearing protectors. Do you have any ideas to sensitize them about this?
Awareness – top to bottom level. Need more social media involvement.

3.4 WORKSHOP SESSIONS

The workshop was structured according to the design thinking methodology to find creative solutions for a common problem, in this case, the problem of finding collective, creative, and realistic ways to address the prevention issue within the recreational noise field in the young population. Therefore, the workshop was divided into four steps are inspired by the phases of the design thinking methodology, which are: empathizing with the population and the problem, defining, and understanding the problem, ideating possible solutions, and prioritization these solutions to identify initiatives to inspire a Roadmap.

To discuss during the workshop, the participants used inspiration from the knowledge, information and recommendations sharing by the experts during the first two days of the symposium.

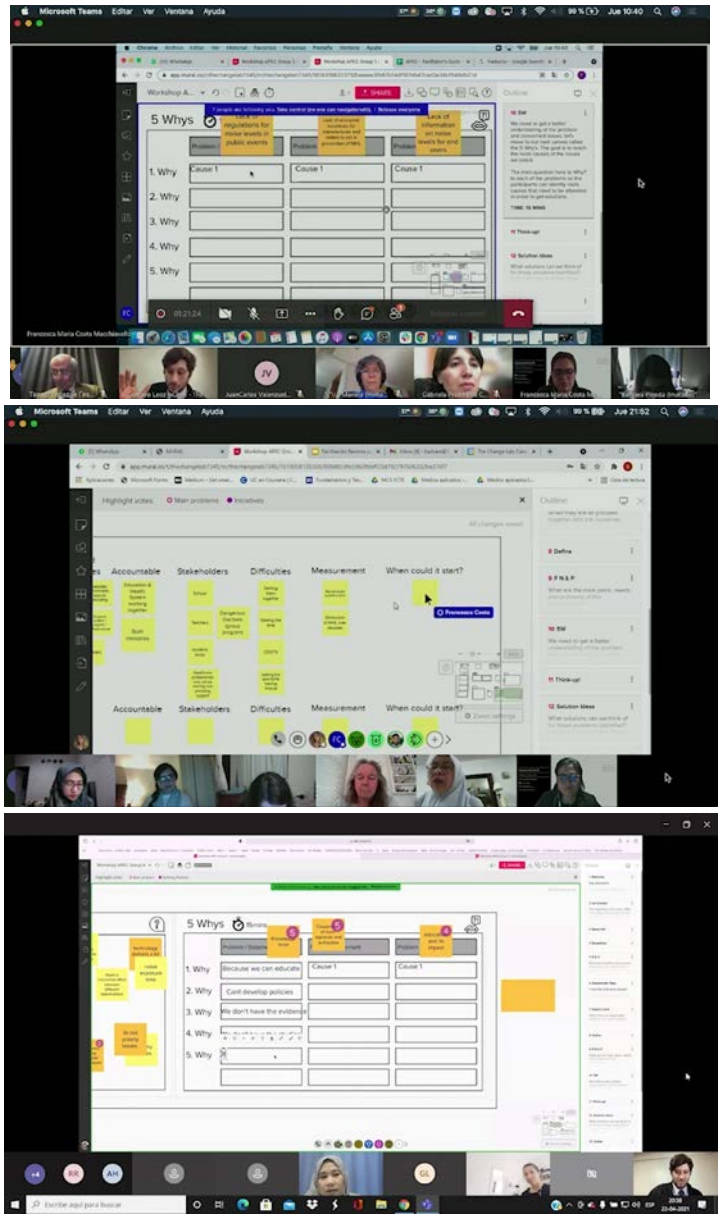


Figure 3-20

3.4.1 Research and Discovery:

The objective of this stage is to get involved with the problem, before going to the solution. In this research and discovery phase, we carry out a process of gathering and analyzing information on the subject, its context and identify the parties involved, with the aim of generating a complete and in-depth understanding of the objectives, scope and limitations of the subject and situation.

Using brainstorm we define and understand the situation, thoughts, and beliefs to identify all the available problems in relation to this issue and then delve into possible root causes of the main problems.

This stage helps us understand the end-user, their needs, thoughts and beliefs and requirements. For this, it is important to use all the information shared during the symposium presentations, and also the knowledge and experience of the participants.

3.4.1.1 Identification of the Stakeholders

In this stage, each group of workshop identified everyone who thinks that is involved in the problem or impacted by the issue concerned with hearing damage due to recreational noise exposure.

We obtained a list of every group, on who is involved or should be involved in the problem. Each stakeholder on the list was grouped by color, regarding their levels of impact on this topic (Figure 3-21, Figure 3-22 and Figure 3-23)

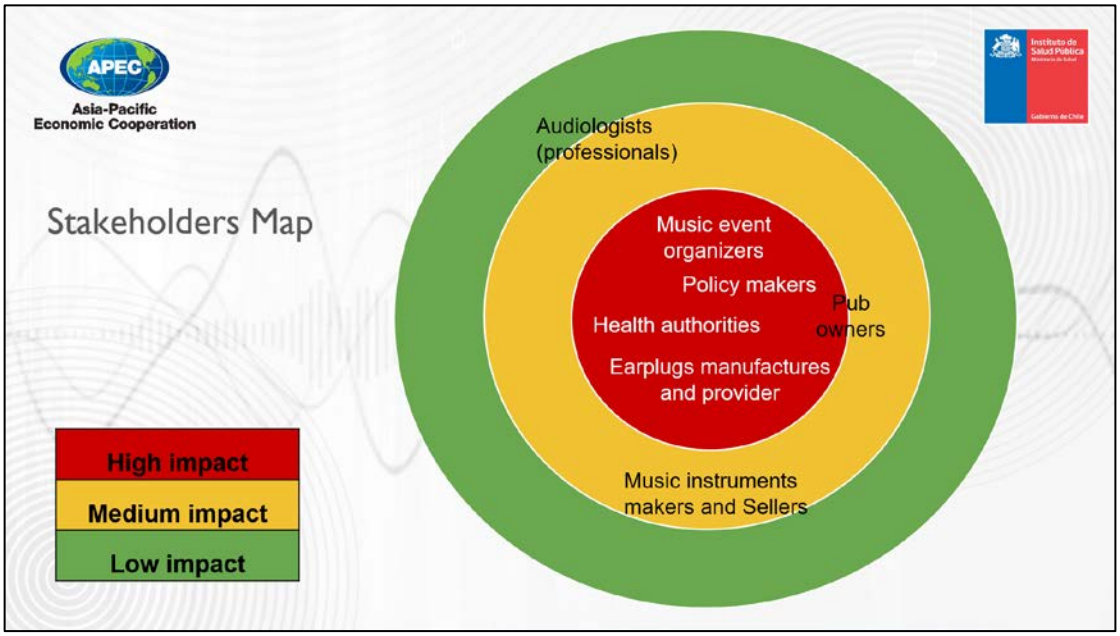


Figure 3-21 Stakeholder Map 1

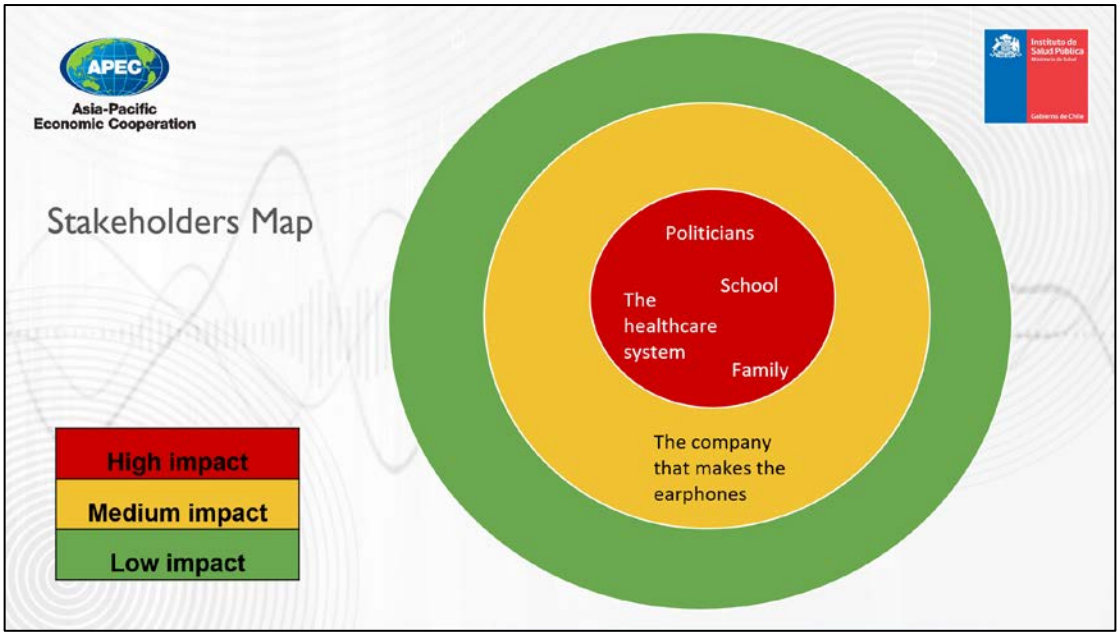


Figure 3-22 Stakeholder Map 2

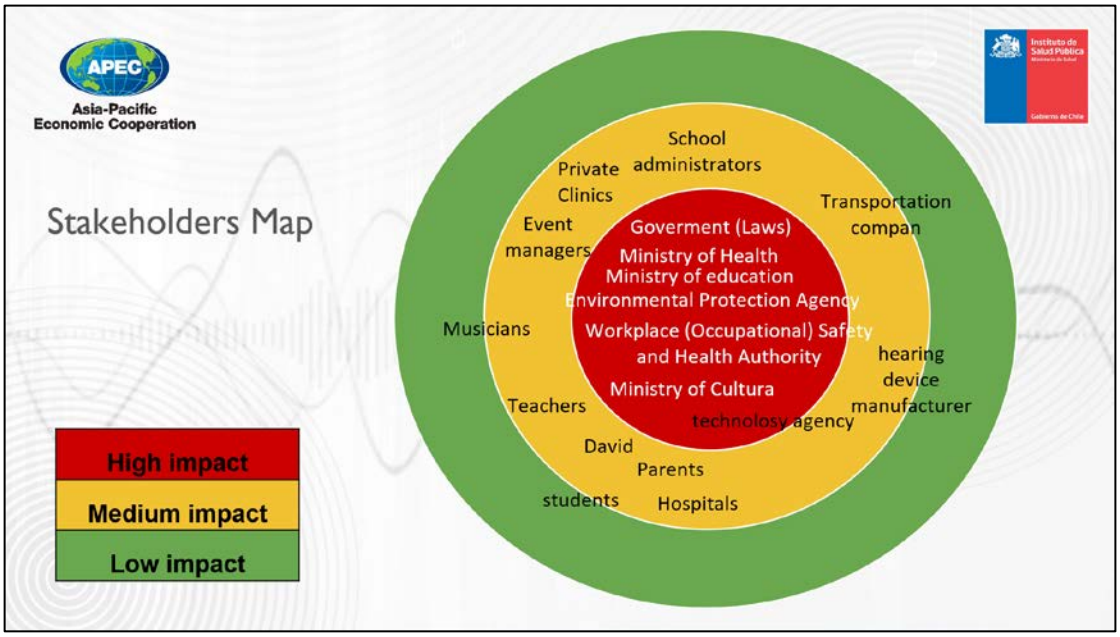


Figure 3-23 Stakeholder Map 3

3.4.1.2 Defining and understanding the problem

In this stage, the problems were defined. Brainstorming was used to try to answer the question of “What are the main pains, needs, and problems of the stakeholders identified?”

The main ideas of all groups were taken and put in figure 3-24

Figure 3-24 Brainstorm with main problems

To get a better understanding of the problem and concerning issues, the 5 Why's methodology was used. The goal is to reach the roots causes of the issues that need to be attended to get solutions. To identify it, the question "Why is this happening" was applied.

The systematized results for this are shown in Figure 3-25 and Figure 3-26.

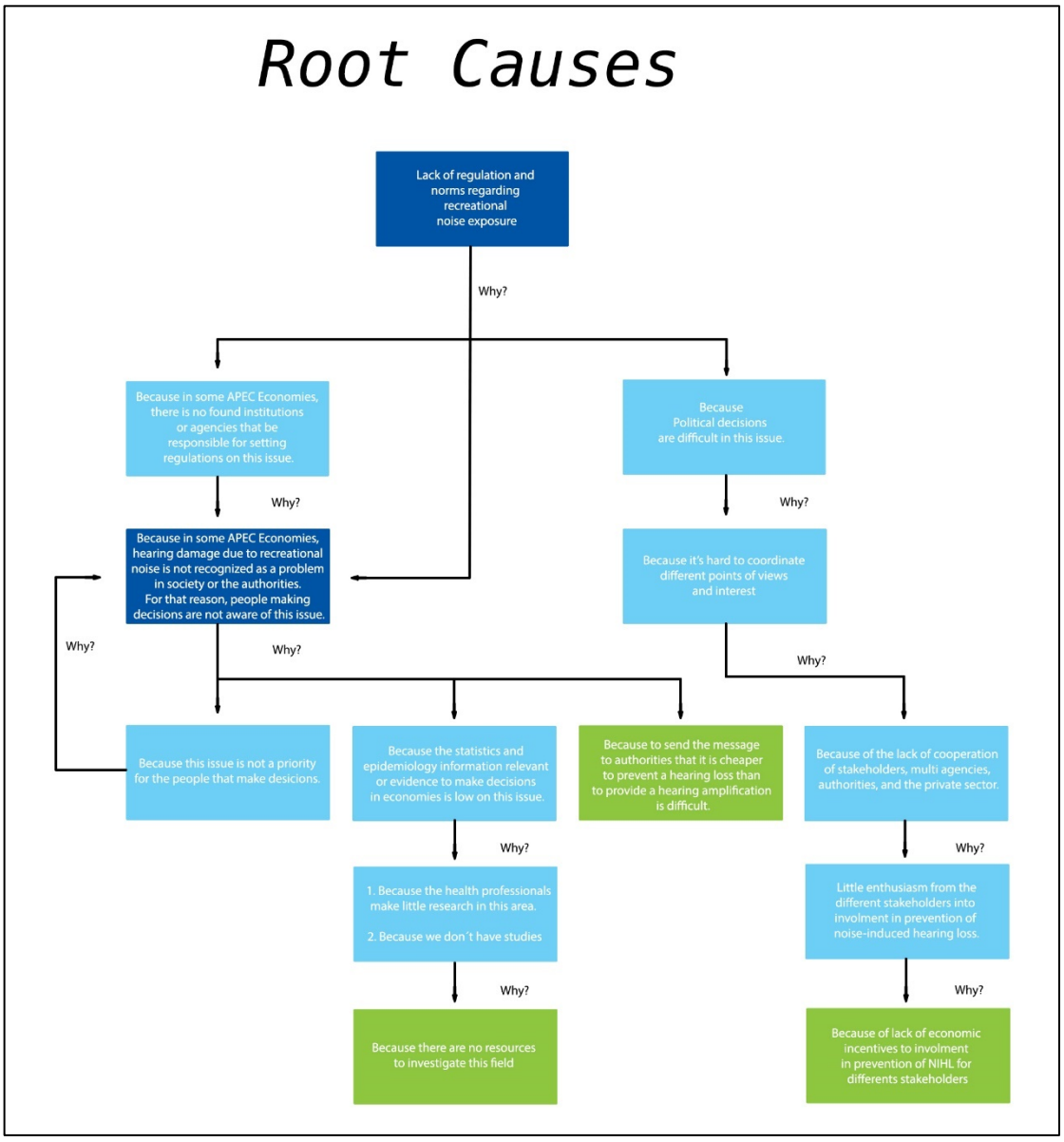


Figure 3-25

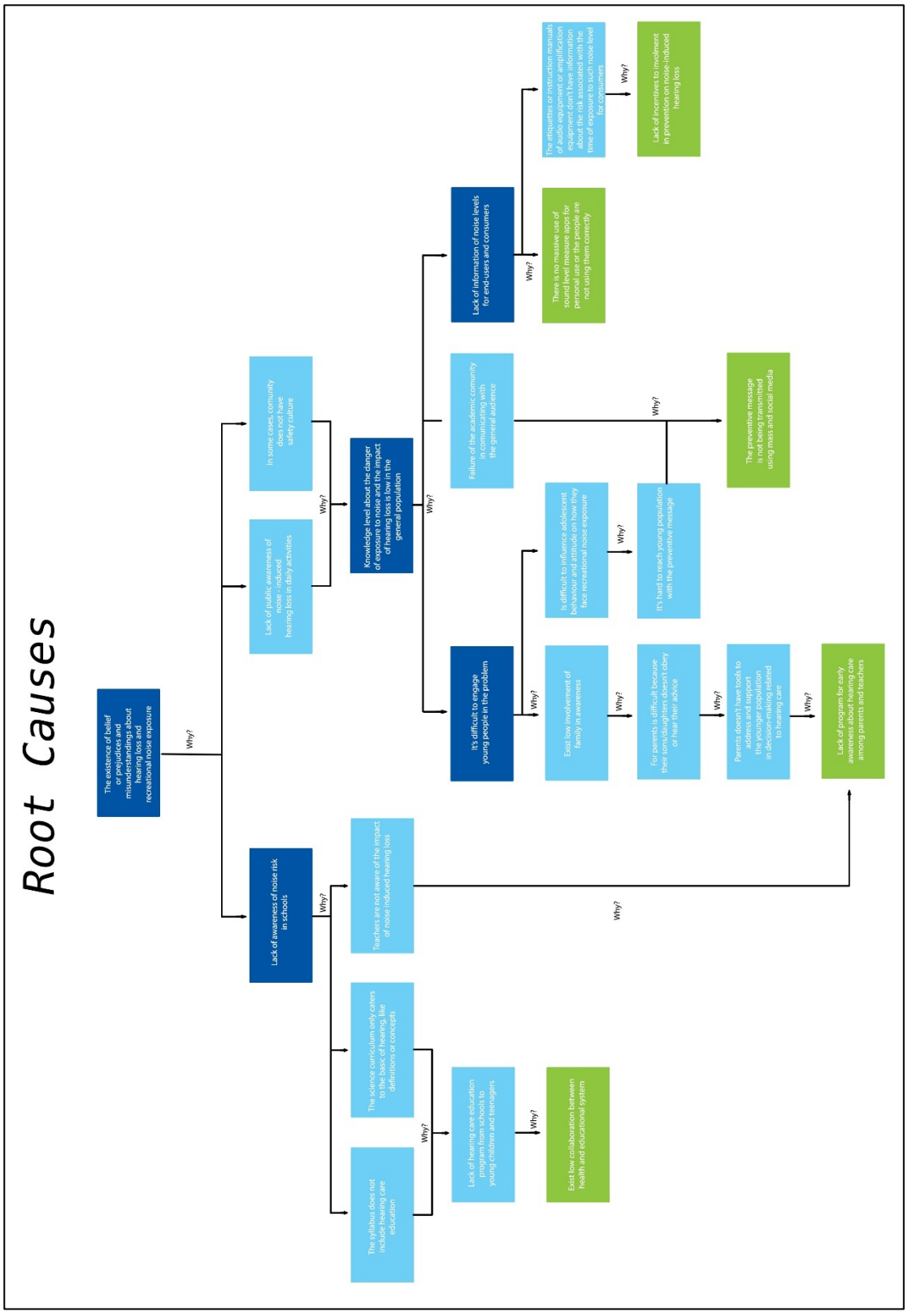

Root Causes
The existence of belief or prejudices and misunderstandings about hearing loss and recreational noise exposure
Why?
Lack of awareness of noise risk in schools
Why?
The syllabus does not include hearing care education
The science curriculum only caters to the basic of hearing, like definitions or concepts
Teachers are not aware of the impact of noise induced hearing loss
Why?
Lack of hearing care education program from schools to young children and teenagers
Why?
Exist low collaboration between health and educational system
Why?
Lack of public awareness of noise - induced hearing loss in daily activities
In some cases, comunity does not have safety culture
Why?
Knowledge level about the danger of exposure to noise and the impact of hearing loss is low in the general population
Why?
It's difficult to engage young people in the problem
Why?
Exist low involvement of family in awareness
Why?
For parents is difficult because their sons/daughters doesn't obey or hear their advice
Why?
Parents doesn't have tools to address and support the younger population in decision-making related to hearing care
Why?
Lack of program for early awareness about hearing care among parents and teachers
Why?
Is difficult to influence adolescent behaviour and attitude on how they face recreational noise exposure
Why?
It's hard to reach young population with the preventive message
Why?
Failure of the academic comunity in comunicating with the general audience
Why?
The preventive message is not being transmitted using mass and social media
Why?
Lack of information of noise levels for end-users and consumers
Why?
There is no massive use of sound level measure apps for personal use or the people are not using them correctly
Why?
The etiquettes or instruction manuals of audio equipment or amplification equipment does not have information about the sound within the time of exposure to such noise level for consumers
Why?
Lack of incentives to involment in prevention on noise-induced hearing loss

Figure 3-26

3.4.2 Solutions Idea and Recommendations

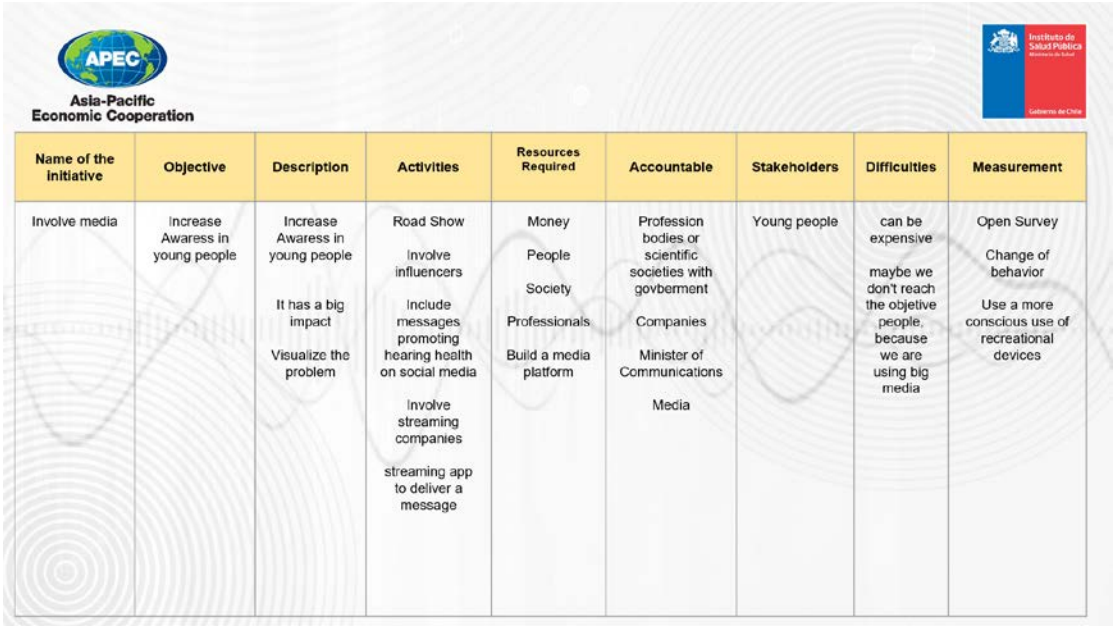
Once the main problems using the root causes (figure 3-25 and figure 3-26) were identified by the workshop team, the participants are invited to think of different possibilities to solve each problem. At the same time, they are asked to recall the ideas emerged during the expert presentations on day 1 and 2 of the symposium as inspiration for this stage.

Each idea and solution proposed is analyzed, and similar ideas were grouped on the same initiative.

Each work team established a list of initiatives. The main initiatives of all groups were taken and put in figure 3-27.

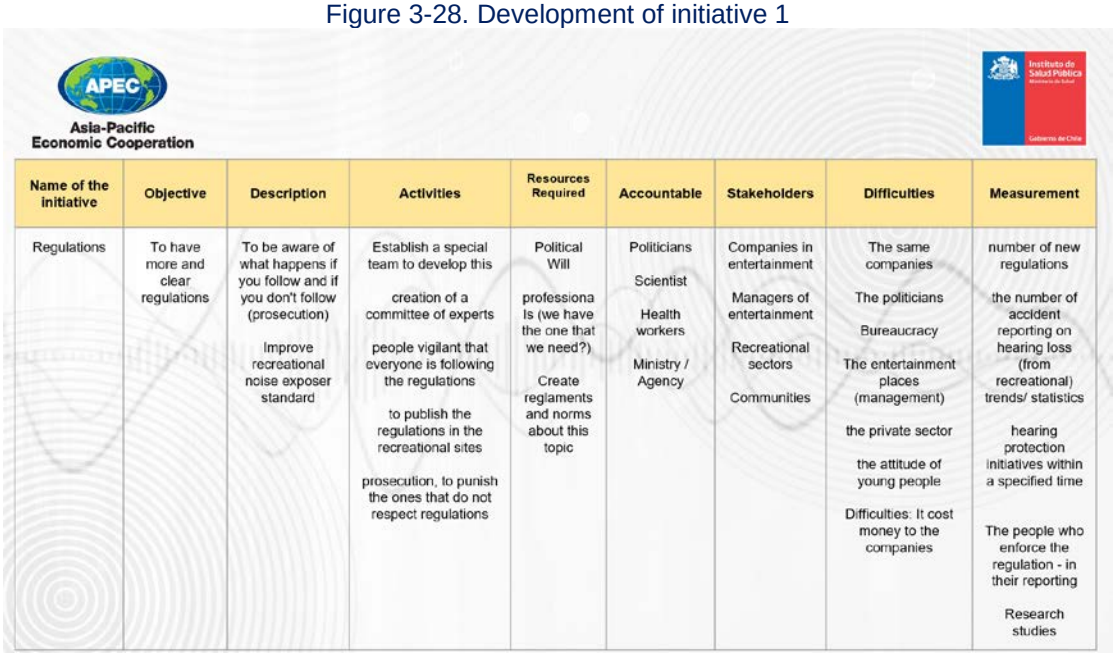
Figure 3-27 Brainstorm with main solutions

Each group chose initiatives to develop the objective, description, activities, resources required, accountable, stakeholders, difficulties and measurement. All this information is shown in figures 3-28, 3-29, 3-30, 3-31 and 3-32



Name of the initiative	Objective	Description	Activities	Resources Required	Accountable	Stakeholders	Difficulties	Measurement
Involve media	Increase Awaress in young people	Increase Awaress in young people It has a big impact Visualize the problem	Road Show Involve influencers Include messages promoting hearing health on social media Involve streaming companies streaming app to deliver a message	Money People Society Professionals Build a media platform	Profession bodies or scientific societies with govberment Companies Minister of Communications Media	Young people	can be expensive maybe we don't reach the objetive people, because we are using big media	Open Survey Change of behavior Use a more conscious use of recreational devices

Figure 3-28. Development of initiative 1



Name of the initiative	Objective	Description	Activities	Resources Required	Accountable	Stakeholders	Difficulties	Measurement
Regulations	To have more and clear regulations	To be aware of what happens if you follow and if you don't follow (prosecution) Improve recreational noise exposer standard	Establish a special team to develop this creation of a committee of experts people vigilant that everyone is following the regulations to publish the regulations in the recreational sites prosecution, to punish the ones that do not respect regulations	Political Will professiona ls (we have the one that we need?) Create reglaments and norms about this topic	Politicians Scientist Health workers Ministry / Agency	Companies in entertainment Managers of entertainment Recreational sectors Communities	The same companies The politicians Bureaucracy The entertainment places (management) the private sector the attitude of young people Difficulties: It cost money to the companies	number of new regulations the number of accident reporting on hearing loss (from recreational) trends/ statistics hearing protection initiatives within a specified time The people who enforce the regulation - in their reporting Research studies

Figure 3-29. Development of initiative 2

Asia-Pacific Economic Cooperation

Name of the initiative	Objective	Description	Activities	Required Resources	Accountable	Stakeholders	Difficulties	Measurement
-Teacher's awareness and training to include issue on curriculum -Giving the teachers resources options to carry this issue in school	-To include NIHL in the countrie's school curriculum -Increase kid's consciousnes s about hearing loss	-Train teachers and make activities to aware kids -Not only in school curriculum but also in teacher training module -Kids have more information about the function of hearing and its important	-Design of Module for Teachers by Ministry if Education -Health Education as an extracuricular activity in teacher's training -Train teachers to Lead research and projects for students to discover the impact of NIHL -Campaign of consequences of NIHL -Songs about love your hearing (preschool)	Education Material -Websites, worksheets, tools for educating -Support system / Logistic / Infrastructure -Influencers	-Education & Health System working together -Both ministers	-School -Teachers -students (kids) -Healthcare professionals who will be training and providing support -Dangerous Decibels (group program)	-Getting them together -Getting the time -COSTS -Getting the approprite training module	-Standarized questionnaire -Diminution in NIHL over decades

Figure 3-30. Development of initiative 3

Asia-Pacific Economic Cooperation

Name of the initiative	Objective	Description	Activities	Required Resources	Accountable	Stakeholders	Difficulties	Measurement
Get funding from companies to support programmes	Get funding from companies to support programmes	Get funding from companies around the issue to iniciatives in this topic	-CRS programmes for the company 1 -Go to the CEO -screenig and awareness about the problem -present the inicitiave -Look upon network with local companies Developes through out national Ear & Hearing care	-Having staff -show evidence the programme is efective	-Ministry of Health -Ministry of education	-School -Teachers -students (kids) -Healthcare professionals who Will be training and proving support	-Compiting interest -Don't have evidence / data to show	Funds

Figure 3-3. Development of initiative 4

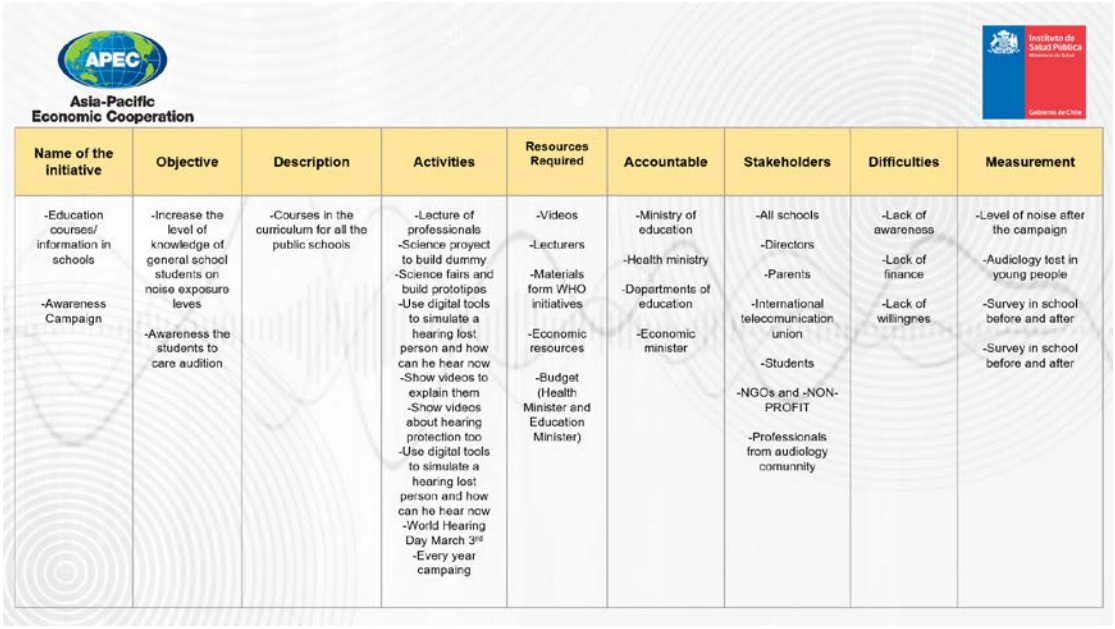


Figure 3-32. Development of initiative 5

3.4.3 Compilation of Workshop results

Based on the discussion of workshop teams, brainstorming with problems and solutions and analyzing of main initiatives, as results of the workshop, the main problems, recommendations and solutions, and initiatives were grouped such as shown in table 3-1.

Table 3-1 Compilation of Main problems, solutions and initiatives of workshop.

PROBLEMS	SOLUTIONS AND RECOMMENDATIONS	INITIATIVE PROPOSED
Lack of research on this issue	1.Development of projects and research of hearing prevention through multicenter collaboration to access more funding. 2. Focus research on epidemiology data.	Development of informatics research data repository with hearing-related databases in collaboration between APEC Economies.
Lack of involvement in prevention of NIHL of private sector	1.Focus research on return on investment (ROI) in hearing prevention for different stakeholders. 2.Apply a tax reduction if companies provide reduction of noise or involvement in the application or implementation of strategy prevention of noise-induced hearing loss in their product. 3.Apply a tax additional for companies that have products that induce hearing loss and not apply any control to it (similar to happening in tobacco product).	Make a Partnerships agreement with private sector in APEC Region for support of Programs for preventing hearing loss

Lack of information to user-end	1. Indicate the need to use earplugs in tickets to concerts 2. Labelling of products that produce noise level that could generate a hearing loss to warning about the risk to the consumer (similar to Chile's Law of Food Labeling) 3. Promote and teach the use of sound level measure app for personal use.	
Lack of regulation and norms regarding recreational noise exposure	1. Take recommendations of WHO, literature and expert about exposure limits (take like reference Dr Neitzel presentation) 2.Take, for example, as a point of entry into this matter of regulations and norms, the experience in other Economies (take like reference Dr Mulder presentation) 3. Promote the incorporation and use of standards, like WHO / ITU-T H-870 Standard in the APEC Region (take like reference Mr Laureyns presentation)	Establish a committee or workgroup of experts with represents different APEC Economies to discuss and develop this issue.
Existence of belief or prejudices about hearing loss and recreational noise exposure.	1.Involve more media and television 2. Use social media (YouTube, Facebook, Spotify) for sending the message 2.Campaign promoted by young idols and influencers 3.Diffusion of noise risks through associations of musicians and bands 4.Create jingles and kid's songs about this issue 5.Involved and support in the campaigns of WHO about hearing prevention, like participated or developing activities for World Hearing Day on 3 March of each year. 6. Use free toolkit elaborated by WHO to promote 7.Collaborate with the young people organization at the community level	Awareness Campaign for communities in APEC Economies, which involves the media like allied to transmit the message of prevention.
Lack of hearing care education program from schools to young children and teenagers.	1.Hold focus groups with different stakeholders (young people, parents, health professionals, musicians, academics, teachers, government represents, private sector represents, so forth) 2. Develop education courses about hearing care and prevention in schools	Work with the teacher and parents' community of the APEC Region to design a collective roadmap with activities and initiatives on this issue.

	3.Support teachers to hold Science fairs and build prototypes about hearing care and prevention. 4. Integrate books with the hearing care and prevention topic for "reading time" session at schools 5. Incorporate hearing care and prevention into the education curriculum.	

CHAPTER 4. ROADMAP

Whit the knowledge shared, and actions were undertaken on this theme in the symposium by all participants, we obtained different recommendations and solutions, and inspired by the development of initiatives by workshop groups, the proposed roadmap to work with the initiatives on table 3-1 was elaborated.

Table 4-1 Information to Roadmap to work with initiatives

STAGE	ACTIONS
Preparation and analysis	1. Establish a committee or workgroup of experts from different APEC Economies. 2. Assess opportunities and risks of different initiatives proposed (considering resources required, funding sources and difficulties) 3. Plan stakeholder and community engagement with a focus on hearing care and prevention (identify different roles and their impact level for different initiatives proposed)
Strategy development	1. Prioritization of actions proposed. 2. Set timeframes and develop an action plan for selected initiatives
Measure planning	1. Identify indicators to monitor progress.
Implementation and monitoring	1. Conduct selected initiatives. 2. Monitor progress and adapt where needed. 3. Disseminate outcomes and lessons learned

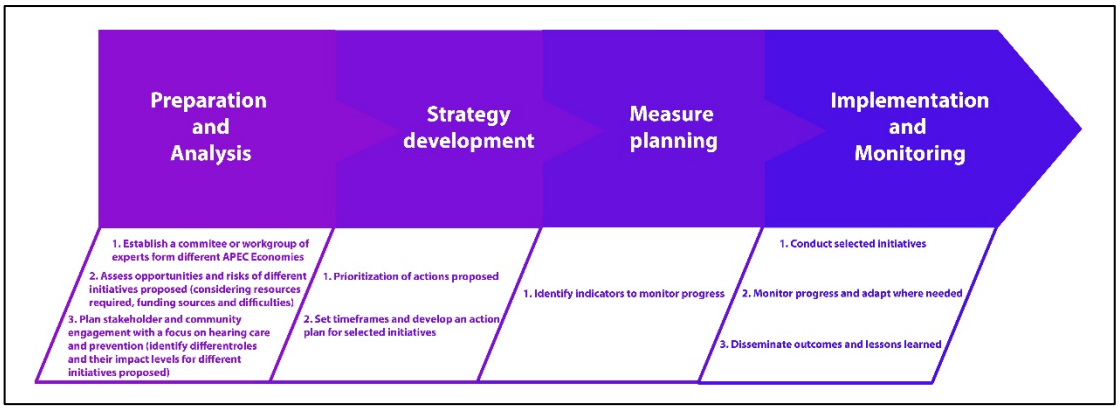


Figure 4-1. ROADMAP TO WORK WITH INIATIVES

CHAPTER 5. CONCLUSIONS

The main objective proposed is to reduce the impact due to hearing loss in APEC Economies. To address this, we should work on two critical topics; preventive actions and promote inclusion and opportunity in the workplace for all people living with hearing loss (figure 5-1).

As a starting point, the project HWG02 2019A worked on looks to recommendations and initiatives to prevent early hearing damage due to recreational noise exposure in young people and increase awareness and capability to formulate strategic actions in APEC Economies.

This report systematizes the survey results about main preventive measures for recreational noise-induced hearing damage and the challenges faced by APEC economies in this issue and symposium activities.

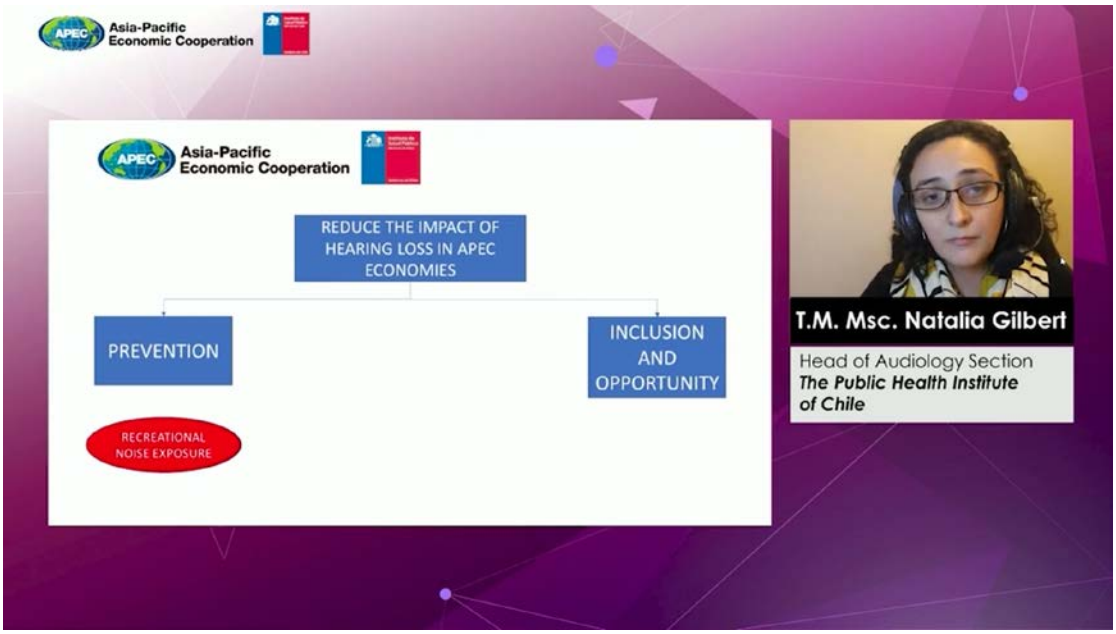


Figure 5-1

In chapter 2, the survey results give us a general insight state into this issue in Region. Also, it was able to broadly identify the real needs and challenges in this issue, which used as input for the generation of the project material. Furthermore, it allowed us to establish a real vision for developing recommendations and initiatives that responded to the region's true needs in this matter.

In chapter 3 the activities of the symposium are developed. The expert presentations showed us the current knowledge and recommendations on this topic, which allowed inspire the participants through the experience of the experts. This laid the foundation of knowledge to establish the initiatives that were proposed during the workshop.

Through the Design Thinking methodology, the problem was analyzed from an approach that seeks to understand the different parties involved, from their roles to their thoughts, fears and desires. This allowed proposing concrete and realistic initiatives for the prevention of hearing damage due to exposure to recreational noise, which was developed and analyzed by the workshop teams. All this inspires us to propose a roadmap for the implementation of all initiatives

This project marks the beginning of a line.

With the evidence of literature and the experts, we have every reason to believe that apply the initiatives proposed will reduce the impact of economic due to hearing loss in APEC Economies. Therefore, the next step after the creation of the roadmap is the design of the implementation plan of the initiatives proposed. The big challenge is to obtain the funds. Therefore, achieve the involvement of the private sector is imperative, but also, we need more the involvement of policymakers. APEC could play a critical role in further advancing the development and testing of implementation initiatives to prevent hearing loss due to recreational noise exposure.