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Call 2018 Noise and Nuisance

Final Conference Report

FAMOS
a CEDR project

SOPRANOISE

STEER
strengthening the effect of quieter tyres on european roads

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CEDR Contractor Report 2022-10

Call 2018 Noise and Nuisance

Final Conference Report

by

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The Project Executive Board for this programme consisted of:

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1. Final conference - Introduction

The final conference of the CEDR Call 2018 "Noise and Nuisance" took place on 07-08 June 2022 in the Belgian city of Liège, gathering participants both in-person and virtually.

Around 40 participants joined at the Van der Valk Congres Hotel, with further participants attending online.

The event provided a forum for members of the projects to present their outcomes and discuss their findings with peers. The conference agenda is available in the Annex of this report.

The three projects under discussion were:

- SOPRANOISE - Securing and Optimizing the Performance of Road trAffic NB with New methOds and In-Situ Evaluation
- STEER - Strengthening the Effect of Quieter Tyres on European Roads
- FAMOS - FActors MOderating people's Subjective reactions to road noise

Etienne Willame of the Wallonia Public Service Mobility and Infrastructures office opened the conference by praising the project partners for their success despite the restraints imposed by the COVID-19 pandemic, which struck in 2020.

"The pandemic changed everything, but resilience, flexibility, and a sense of duty have helped you to succeed," he said.

Willame stressed the importance of noise mitigation - the focus of the projects - noting that the European Environment Agency (EEA) considers noise pollution to be one of the most significant environmental health concerns facing Europe.

Following Mr Willame, the floor was given to Ian Holmes, Principal Advisor on Noise with National Highways England and the PEB Chair.

He explained that tackling noise pollution from road transport was suggested as a theme worthy of in-depth exploration during a brainstorming session at a CEDR workshop in 2018.

The discussions in 2018 identified three issues which would shape the subsequent projects:

- How can we make in situ testing safer and more efficient? (SOPRANOISE)
- How can we improve the take up of quieter tyres? (STEER)
- How can we improve the perception of noise even if we cannot decrease the decibel level? (FAMOS)

While the first day of the conference provided participants with a general overview of the work carried out by each team, the second day was devoted to more in-depth discussion on the

methodology and results. These sessions included a higher degree of interaction from the floor, with questions and remarks put to each of the project teams.

At the end of the conference, Ian Holmes summarised the achievements of each project and commended the project members for adapting to the unprecedented challenges posed by COVID-19 (particularly the speed with which all members became impromptu experts in using Microsoft Teams, he quipped).

All presentations given at the event are available to download on the CEDR website.

2. Introductory sessions

2.1 SOPRANOISE

The SOPRANOISE project was presented by Jean-Pierre Clairbois of A-Tech / Acoustic technologies SA. The aim of the project, he explained, was to make in situ testing and repair of noise barriers safer and more effective, whilst growing the level of knowledge of noise barrier performance within the EU.

By their nature, noise barrier tests take place along busy highways with traffic moving past at high speeds. By reducing the amount of time required to carry out accurate noise tests, and by designing the technical equipment to be simpler to transport and set up, the level of risk is reduced.

The project, thus, sought to develop accurate testing equipment that is easier to use than the current technology employed.

Over time, noise barriers degrade, leading to cracks and holes. These holes, even if relatively small, can have a drastic impact on the level of noise that is audible beyond the barrier (the noise differential was compared by a participant to the difference between having a window sealed shut or partially open in a home).

A method of visual inspection of noise barriers - essentially searching for visible sources of noise leaks - was developed. If found, the project's innovative measurement system could be deployed.

The project outlined a method for a visual inspection procedure to judge the severity of sound insulation leaks. By adhering to a set protocol, a first qualitative approximation of effects on the acoustic performance of a noise barrier could be estimated.

The protocol developed by the project requires the person inspecting the sound leak to fill in an excel file under the following headings:

- Location
- Acoustic condition
- Size of the critical radius of the leak (this determines how severe the noise leak is)

The "acoustic condition" is judged on a traffic light scale, with green acceptable, yellow indicating further testing is needed, and red meaning that repair is required.

However, for proper quantitative statements, technical measurement is necessary, which is where the project's transportable and efficient testing equipment comes in.

Standard testing equipment is bulky, involves an array of cables, and is relatively complicated. The testing equipment developed through the project is more portable and does not require extensive training to use.

Massimo Garai of the University of Bologna outlined the project's work in developing the lighter and easier-to-use noise testing equipment. It uses a lightweight loudspeaker, a linear microphone antenna, and is battery powered.

In laboratory experiments, the newly developed test equipment showed excellent agreement with standard test equipment. One of the primary benefits of the new test equipment is its speed - it significantly increases the number of tests that can be carried out during a single day.

However, while the system developed under the project can provide accurate readings, it is not certified for official use, the project partners said. Therefore, if an issue is identified, it must be recertified using sanctioned measurement equipment.

Marco Conter and Andreas Fuchs of the Austrian Institute of Technology (AIT) explained the projects' contribution to expanding database information on the acoustic performance of noise barriers. Over 2,000 datasets were drawn from nine countries - Austria, Belgium, Germany, Spain, France, Ireland, Italy, the Netherlands, and the UK.

The project gathered both theoretical and practical background information on measurement methods to understand the acoustic performance of various noise barriers. A range of materials were tested, such as metal, wood, and concrete.

Having an overview of the properties of various noise barriers allows national road authorities to set meaningful targets for sound absorption and reflection, as well as sound insulation.

Project partners found that there is no perfect noise barrier that could apply to all locations. The idea of having a rule of thumb is unfortunately too simplistic.

Noise barriers can provide very high and effective noise reduction but only if they are correctly designed, built, monitored, and maintained during their whole lifetime. It should always be the acoustic design study that fixes the values, it was concluded.

2.2 STEER

Erik Buhlmann began the STEER project presentation by asking participants to respond to an online poll that consisted of a single question:

What is the most important purchase criterion for you when buying your recent tyres?

The options given were: “fuel consumption”, “wet grip”, “price”, “noise”, “dry handling”, or “none of them”.

“Fuel consumption” topped the poll, with “wet grip” the second most popular factor.

“Noise” scored highly among participants, coming in third place, though it was stressed that a congregation of noise experts isn't necessarily reflective of the views of the general public.

For most people, price trumps all other concerns (the salary of participants must be high given that price wasn’t number one in their responses, Buhlmann joked).

The STEER project aimed to make tyres quieter and to have labelling that better reflects the noise of tyres in real-world conditions.

Currently, label values designating the noise of tyres are often not reproducible - what is found in one study may be completely different in another. This makes the labels largely misleading. “In short, the uncertainty of the current labelling procedure is way too high,” the presenter summarised.

The inability to reproduce tyre noise stems from several factors.

It is up to manufacturers to choose the test track, the test vehicle, and to select the set of tyres to be tested. But the track, vehicle, and driving style all contribute to variations in noise.

For example, the level of noise produced is altered by the level of sound absorption of the test track itself. Unsurprisingly, this incentivises companies to choose the most silent track to test their tyres.

To solve this issue, the project recommended referencing the tyre calibration procedure, enforcing stricter requirements for test vehicles (with a focus on the car underbody), ensuring the temperature in which the test takes place is consistent, and implementing indoor testing on laboratory drums.

It was admitted, however, that some recommendations may be difficult to implement in practice. The tyre industry is likely to resist calls for a standardised vehicle based on national and practical considerations (it is unlikely they will be able to agree on a single brand, for instance).

Manufacturers are generally hesitant to invest heavily in producing quieter tyres, partially due to low consumer awareness and demand, but also because of fear over safety trade-offs necessary to quieten tyres.

However, an analysis of a Swiss tyres labelling database shows that quiet tyres can also perform well in terms of wet-grip and rolling resistance (though it's not an easy task, added the presenter).

It was found that there is a high reduction potential to make tyres quieter, with improvements of up to 3dB, which would bring considerable financial benefits.

The project put forward the following recommendations to improve the market share of quieter tyres:

- Act as early as possible (recognising the increasing electro mobility trend)
- Industry agreement and consumer incentives are effective measures (we could decide to offer tax exemption for AAA tyres or low-noise tyres)
- Raise awareness of the noise problem among the population
- Consumer organisations should promote quieter tyres
- Investigate and test measures for a possible implementation of consumer incentives to buy AAA Tyres
- Implement radio-frequency identification systems to detect and encourage the use of low noise tyres in traffic

From the perspective of National Road Authorities, choosing smooth to medium textured road surfaces and avoiding rough-textured road surfaces can also help.

The project recommended awareness raising campaigns be launched to inform consumers of the benefit of choosing quieter tyres. This could be coupled with consumer incentives. Those procuring road vehicle fleets, for example, should be strongly encouraged to include quiet tyres among their criteria.

Picking up on the flaws in the labelling system, an audience member asked: If there is no correlation between the test and the accuracy of how quiet tyres are, how can we convince people to buy them?

The presenter responded that implementing the project suggestions can greatly improve the accuracy, however, there will still not be a perfect correlation.

Another participant asked whether making the noise label larger and more visible would make consumers more likely to consider noise when making their purchase.

Buhlmann agreed that the small size of the pictogram on the label is part of the problem. However, industry might push back on this he warned, as the industry argues that since people aren't interested in noise there is no need to make it so prominent on the label.

2.3 FAMOS

Hans Bendtsen, a Senior Consultant with FORCE Technology, outlined the results of the FAMOS project.

The project studied perceptions of road noise to determine if steps could be taken to reduce annoyance even if the noise itself was not reduced. While originally slated to run for 2 years, the project was extended due to disruptions caused by the pandemic.

Road administrations use technically feasible and economically realistic measures to reduce noise, but more can be done to reduce the level of annoyance even if the limit of noise reduction is reached.

"Annoyance" was defined as "Noise + Context + Person", or "an emotional and attitudinal reaction from a person exposed to noise in a given context".

It is influenced by a number of factors, from personal (how sensitive are people to noise?) to social (what is the relationship between the road owner and the public?), to context (is the road visible? Is it flanked by greenery?)

The commonly used legal noise limit of 58dB does not affect everyone equally - some 8% of people are annoyed at this limit. However, the project found that the introduction of certain elements - known as “moderators” - can significantly influence the level of annoyance even though the level of noise is unaffected.

For example, if trees are removed and the road is visible, people feel that the environment is louder, even though trees do not actually block sound.

Other moderators identified by the project include the perceived level of traffic safety in the local area, the design and materials used in noise barriers, and the number of local parks or quiet areas which can act as an “oasis” with minimal noise.

Good public participation processes from road authorities that make the public feel part of the noise reduction process can alter the perception of annoyance by an equivalent range of 20dB, it was found. However, it should be noted that this can go both ways - 10dB towards lower annoyance levels, or 10dB towards higher annoyance levels. This is largely determined by whether the public is trusting or mistrustful towards authorities and road owners.

During periods of construction, extra engagement is needed, with the example given of setting up a hotline for noise complaints. Temporary noise barriers during periods of construction are a good idea, as they show a willingness to tackle the noise issue.

Working with residents to understand their perception of noise is also important. This includes conducting so-called "soundwalks" in neighbourhoods, in which residents are asked to rank the level of annoyance caused by noise pollution. Surveys are also seen as useful to capture public attitudes.

3. In-depth discussions

3.1 SOPRANOISE

The second presentation by the SOPRANOISE project provided a practical overview of the work carried out in the project.

A practical run through of the visual inspection protocol - which provides a qualitative approximation of the effects of leaks on the acoustic performance of a noise barrier - was carried out, with an example drawn from the German town of Asperg.

Participants were shown photos of a road barrier in Asperg and asked to imagine they were tasked with inspecting it. The presenter then went through the process of filling in the excel form designed by the project, starting with recording the type of material used in the barrier. The file also allows for specific defects to be noted, such as rust, degradation, deformation, etc.

In the case presented, a hole had appeared under the barrier as the ground had been washed out, likely because of heavy rain.

The "defect location" (in this case under the barrier) was entered into the excel file, as was the degree to which it was possible to peer through the hole (the greater the visibility, the greater the sound leakage).

A second example of a visual inspection was presented, this time from the town of Vaihingen. In this case, noise barriers were missing sealants, while wood slats had fallen loose, exposing gaps.

The benefit of using the spreadsheet approach, participants heard, is that it can be implemented in a simple and fast way on site and absorbed into existing inspection procedures.

The information added to the spreadsheet yields immediate results, providing a relevant, initial qualitative rating of the effect of leaks. From this information, the user can decide on the next step to take.

No decibel value is recorded, however, as it requires too many assumptions.

There was some discussion over the frequency of such inspections, as the leakage of a new barrier is not usual for some years - it is usually after 5 - 10 years of usage that a leak may be expected.

One participant asked if walking while inputting the information, which requires manoeuvring along the noise barrier next to a road, is practical.

The presenter explained that they filled in the form using a pencil and paper while in situ. This was then typed up once they had access to a laptop in a calmer area.

It was suggested that a tablet could be a good solution, as it could be easily used while walking. “Practicality for the tool is crucial, otherwise it won’t be used,” said an audience member.

Participants were then shown a video from the University of Bologna of the laboratory tests being performed.

In the video, what appears to be a speaker stand hooked up to a black box is positioned in front of a barrier. It is explained that the black box sends noise signals which are picked up by the microphones.

The microphone system is then positioned on the other side of the barrier.

The benefit of the SOPRANOISE testing method - which uses six digital MEMS-microphones - is that skilled operators are not required, and the equipment is light and easy to move.

The six high-precision microphones ensure that the totality of the barrier is covered, giving an accurate description of the amount of noise blocked.

The whole process, it is said, takes 10 minutes, after which the tester can simply move to another location.

The quick measurement method (step 2) fills the gap between in-situ visual inspections (step 1) and full testing according to EN 1793-5 and EN 1793-6 standards (step 3).

Discussion

Following the presentation, participants asked the speakers questions. Below is an overview of the discussion:

Q. How easy is it to set up the measurement system if the ground is not level - if you’re on a slope, for example? Are there any modifications which could make using it easier in real life?

A. It’s a good point. It is necessary to have a certain diameter of ground to place the system. But the weight of the system is light. It’s certainly an improvement compared to setting up the previous heavy grid equipment.

Q. Have you considered PU probes for the testing?

A. We reviewed all methods, and we did consider PU probes. But every method has advantages and drawbacks (the limitations of the frequency range was a point of consideration). The method we ultimately chose has the best chance to be successful - and indeed, we proved it was a good choice. Of course, there are many ways to go about it - in the past, in France, they used a gunshot as the standard noise test method...

Q. Regarding the spreadsheet approach, in which a person inspects the noise barriers and records possible faults, I see this as a way to raise awareness for the road authority about the importance of maintenance. Despite spending millions on the barrier, the road authority may have forgotten about it. It's important to communicate that this is a huge investment, and it needs to be taken care of and maintained.

A. Yes, indeed. I'm from Liège. I've seen noise barriers which haven't been maintained for 40 years. If I didn't brush my teeth for 40 years, imagine the problems!

We have more noise in areas where the barriers were never maintained. It's like a bridge - without monitoring, the bridge will fall.

In our investment plan we decided to invest to renew barriers considering noise maps and our database. We have to decide what to upgrade or what to simply renew. When you have a big renovation of highways you may decide to upgrade the noise barriers, which helps to keep an overview of what is new.

Q. Graffiti is also an issue with noise barriers. Is there any process for removing graffiti? You may be doing that since you're looking so seriously at the barriers.

A. Well, there's an additional benefit in that the inspections allow you to better understand the products. We gain a better understanding of the barriers since we can test much more often. We are not blocked anymore by the problem of money.

It's important to have a tool that allows anyone to correctly assess the noise barriers' characteristics given the varying exposures they have to them.

3.2 STEER

The second day of the CEDR conference kicked off with a presentation on the STEER project from Erik Buhlmann and Felix Schlatter, which examined ways to boost the uptake of quieter tyres in great depth.

It was stressed that quieter tyres can make a significant difference in reducing noise, both on highways and in cities.

While in other countries (such as China and Brazil) there are around five grades for determining tyre noise, the EU noise label only has two - A & B. This approach is too broad in the project team's opinion.

The current testing procedure to determine the noise of tyres is fraught with uncertainty. Several elements can vary significantly: the test vehicle, the test tyres, the test track, and the weather can all play a role in altering the test outcome.

Tyres that share the same description or product name may have different dimensions, load index, or speed rating but the labelling regulation does not require all variants of tyres to be tested. Often, only the noisiest tyres are tested to save money and then the other tyres are given the same label.

The solution, according to the project team, is to increase the uniformity of the variables.

This includes using a laboratory drum for testing - a scientific means of obtaining a reproducible result. The model of test car, as well as the overall state of the vehicle, should be limited to the extent possible, with more restrictive rules for the wheelbase and ground clearance.

To remove the uncertainty caused by variations in temperature on the test track (a test carried out in Sweden is unlikely to take place in the same weather conditions as a test carried out in Spain, for example), it is recommended that testing be conducted in a temperature-controlled environment.

Test tracks should also follow ISO requirements in terms of surface. While a quiet tyre should be quiet on all forms of asphalt, some minor changes are possible depending on how abrasive the surface is. The rougher the surface, the higher the noise level.

For this reason, road authorities are encouraged to choose "smooth" to "medium" textured road surfaces, particularly in residential areas.

Participants were told that if the STEER recommendations are followed, the uncertainty inherent in testing at present can be halved.

The presentation then focused on how the market share of quiet tyres could be improved.

One idea put forward was to give targeted subsidies to manufacturers to produce tyres with low noise limit values, and to offer consumers incentives to buy AAA class tyres.

Already consumer trends are shifting, which will impact noise levels from tyres in the coming years:

- The number of electric vehicles on the road is rapidly increasing, thanks partly to changing consumer sentiment and shifting market priorities (additionally spurred by an upcoming EU-level agreement to ban the sale of petrol and diesel cars from 2035)
- Consumers are generally buying heavier vehicles, such as SUVs with wider tyres, which could increase tyre noise
- Many local and regional governments have introduced lower speed limits in urban areas (such as the shift to 30km/h), a noise abatement trend that is likely to continue

As mentioned, there is a reluctance from tyre manufacturers to construct low-noise tyres, as there are concerns that doing so will impact other areas of performance. According to the European Tyre and Rim Technical Organisation (ETRTO) and the European Automobile Manufacturers Association (ACEA), there is a conflict between safety (wet grip) and noise reduction.

From the three tyre prototypes constructed within the project, it was indeed found that there are trade-offs. However, compromises are typical in product development.

To increase the uptake of quiet tyres, it was recommended that information campaigns be carried out. It is also a good idea to inform motorists that quieter tyres will reduce noise inside the vehicle - this may be more attractive than saying it will solve an issue for others.

It was further recommended that three legal noise classes be added to the tyre label, which is an important information tool for consumers.

In many European countries, considerable financial benefits can be expected from the avoidance of external costs through quieter tyres. These benefits will likely offset additional costs.

Recommendations stemming from the project will be provided to standardisation and regulatory bodies, it was said.

Discussion

Q. If consumers were incentivised to buy quieter tyres, would it perhaps encourage manufacturers to do more testing to prove their competitive advantage?

A. Having a dual track looking at consumers and manufacturers is important. But at the moment noise is unfortunately not high up the list of importance for consumers.

Q. In Denmark there's a political interest in raising the problem of noise labels towards the Commission.

A. The European Commission is in the process of amending the regulation on maximum noise for vehicles. In about one year, there will be the first proposal. The work is going on in Geneva [at UN-level] as well.

Q. If you consider microparticle emissions from tyres and road surfaces, they are higher than from the engine. Will quiet tyres emit more or fewer microparticles?

A. If you work with softer compounds, this may have an influence. Dampening materials, for example, could have an impact on abrasion and particle emissions. But this needs to be investigated further.

Q. The final decision to buy a set of tyres rests with the car owner. But why doesn't the manufacturer of the vehicle mount quieter tyres as standard? Consumers also need the right information to choose the right type of tyres.

A. Some manufacturers are under pressure to produce cleaner and quieter tyres from car manufacturers. In terms of the aftermarket, there is a problem if the consumer makes bad choices.

Everybody is interested in comfort. The comfort you get from quieter tyres makes a real difference. I bought quieter tyres and noticed the difference immediately. It's a choice for yourself, not just for the neighbours.

Q. Is there a way to measure the interior noise for drivers (particularly for professional drivers, such as truckers) and to link this to labelling?

A. There are car consumer organisations which have a wide audience. These consumer organisations have their own evaluation of different products. The results of their tests would certainly be of interest to consumers

Q. What about the uncertainties you mentioned?

A. One of the most important elements is to standardise the vehicle being used for testing. Implementing the project recommendations will greatly help. But in terms of manufacturing quiet tyres, if the trade-off means safety problems, it will undermine trust in the label. It's a balance.

Q. I want to buy a quieter tyre. But what is the best tyre I should buy? The in-depth labels you showed (circles with various colours) are confusing!

A. Many tyre dealers don't understand the labels either. You probably won't get good advice from a tyre dealer unless they have been educated on this. It is complicated. There needs to be help from consumer organisations and through independent rankings. Otherwise, we need a government database for this.

3.3 FAMOS

Noise annoyance, regardless of the actual level of noise, adversely affects quality of life. Chronic noise annoyance can lead to cardiovascular disease, heart attack, dementia, stroke, and certain cancers. Children's health and learning is also negatively affected, participants heard.

But the level of annoyance caused by road traffic differs from person to person. Wind turbines, for example, seem to be highly annoying to some people, though they are less loud than traffic or planes.

The FAMOS project presenters explained the concept of "annoyance equivalent noise level shift", which was defined as "the (hypothetical) shift in noise level that will give the same change in annoyance as the presence or absence of a moderator".

The term moderator, used frequently in the presentation, denoted an element that helps to reduce the perception of noise.

At the outset of the project, a literature survey was carried out on noise annoyance, with some 142 studies consulted.

It was found that:

- Trust in authorities affects the level of noise annoyance
- If residents have access to a “quiet side” of their apartment, they are less annoyed by noise
- The perceived level of traffic has an impact on the perception of noise

To investigate the phenomenon, the project carried out a number of surveys. Although originally planned to be in-person, due to the COVID pandemic they took place online.

Flyers were sent to homes directing recipients to an online questionnaire. However, German GDPR rules meant responses could not be tagged to a specific location. This caused a degree of uncertainty in evaluating the actual level of noise experienced by survey participants compared to their perception.

The responses showed that a visual moderator is extremely important to people, even if it provides negligible soundscape benefits in real terms. No greenery, for example, showed worse results in terms of noise perception than 100% greenery.

The project also carried out so-called ‘sound walks’, in which residents were invited to help assess the local soundscape. A total of 18 people (none of whom were sound experts) took part. They recorded their answer to the question “how annoyed are you in this position?” using a sliding scale in a variety of locations.

In addition, project partners made video and noise recordings at various spots. They then showed participants differing images while playing the noise from the areas. Participants were asked to outline how annoying they found the noise from each location. In general, the listeners marked the spots with greenery less loud than those without.

The data collected by the project largely confirmed the findings in the literature study.
However, while the surveys were interesting and showed certain trends, there was not enough information for detailed scientific modelling.

To encapsulate the findings of the project, a guidebook was developed. The FAMOS Guidebook, which is downloadable from the CEDR website, provides useful information for road administrators looking to deploy moderators to reduce noise annoyance.

Discussion

Q. [Marco Paviotti from the European Commission] When I was involved in drafting WHO noise guidelines, the top priority was that studies were reproducible. Was it the case from your literature review that multiple studies found the same thing?

A. We tried to include as many studies as possible to have a comprehensive overview. Many studies did indeed find similar results.

Q. There are people who do not accept the soundscape they reside in, while others accept they live in a noisy environment. Is it about massaging attitudes?

A. Indeed, socio-acoustic surveys showed differing attitudes. In the project, we created curves to map levels of annoyance. We found that even if you comply with limits, there is still a significant percentage of people that will remain annoyed.

Covering the visibility of the traffic with greenery helps in these instances, for example. The visual element has a significant influence - it accounts for around 4dB according to our findings.

That said, there are some opposite findings. The hypothesis is that the images of greenery could result in disappointed expectations of noise reduction.

Q. How important is it to keep the local community informed of these types of decisions?

A. We have some experience in Denmark with tackling communication issues. Citizen groups feel they have been heard when you're out talking to them. They can understand what's possible and what's not possible. We get less complaints when we actually talk to people, in whatever format that takes. It improves trust.

Q. There is no EU-wide law on noise but rather there are national limits. Even if you meet national requirements, there still may be citizens that feel annoyed within the legal limits. How would you reconcile what's required by law and what could be perceived by citizens?

A. Yes, even if you stick to the noise limits, you still have around 10% of people that are highly annoyed. But with moderators you can decrease this percentage. Frankly, there are a lack of studies that correlate the level of annoyance with an increase in adverse health effects, which is an important element to keep in mind - that the perception of noise can make people sick rather than the decibels.

Fulfilling the noise guidelines is often not enough - you need to do something more! Moderators can help.

4. Conclusions and implementation recommendations

Following the meeting in Liege, the PEB met via Teams on 14.09.2022, to discuss plans for implementation of the findings of the three projects, and monitoring of their outcomes. Overall, the PEB members are very pleased with the outcomes of all three projects and consider that the aims of the programme have been met, as set out below:

- SOPRANOISE was successful in identified methods to make in situ testing of barriers safer and more efficient, by showing that less bulky equipment and fewer measurements can give similar results to the 'full' testing method that is set out in European Standards.

- STEER provided good recommendations for improving European Standard methods for testing tyre noise, which have the potential to improve consistency and repeatability. The project also provided practical recommendations for increasing the take up of quiet tyres, and quantified the benefits that would be gained through more widespread adoption of quieter tyres.
- FAMOS was able to quantify and compare non-acoustic factors that can influence public perception of traffic noise. The work provides a framework for Roads Administrations to better understand the influence of their actions on how people react to noise, so they can make better decisions when planning and undertaking maintenance and improvement projects.

Initial plans for implementation include:

- Trialling use of SOPRANOISE testing methods for highway noise barriers. Exploring the potential for these methods to be incorporated within European Standards, either as replacements for the existing methods or to complement existing standards.
- Use of the FAMOS findings to Prepare of best practice guidance to help Road Administrations reduce the impact of noise on communities close to highways, both during routine maintenance and road improvement works.
- Exploring the potential of using STEER findings to improve European Standards for testing of tyre noise.
- Using the findings of STEER to feed into a study of the wider environmental performance of tyres and brakes, including particulate emissions to air and water.

The PEB will meet again to discuss implementation in Spring 2023.

5. Annex: Conference agenda

CEDR Transnational Research Programme
Call 2018 Noise and Nuisance

Agenda of the FINAL CONFERENCE

Date: 07 - 08 June 2022

Location: Van der Valk Hotel Liège, 2B, Esplanade de l Europe - 4020 Liège, Belgium

Programme Day 1

12:00	Registration & Business lunch
13:00	**Welcome** • Opening of the conference: Etienne Willame, Wallonia Public Service Mobility and Infrastructures
13:10	**Summary session with internet broadcast** • Introduction: Ian Holmes, National Highways • 30-minute summary presentations of each project with Q&A: - SOPRANOISE - STEER - FAMOS • Next steps by the PEB
15:30	Break
15:50	**SOPRANOISE** – *Securing and Optimizing the Performance of Road trAffic NB with New methOds and In-Situ Evaluation* – Demonstration of project results followed by group discussion on implementation and open questions
17:30	End of Day 1

Programme Day 2

09:00	**STEER** – *STrengthening the Effect of quieter tyres on European Roads* – Demonstration of project results followed by group discussion on implementation and open questions
10:30	Break
11:00	**FAMOS** – *FActors MOderating people's Subjective reactions to road noise* -– Demonstration of project results followed by group discussion on implementation and open questions
12:30	Summary of discussions (implementation issues, open questions, next steps) and closing remarks
13:00	End of Conference

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