

(OICA/ACEA/ATEEL) Study on future sound limits values for type-approval for vehicles of category M & N

TFVS-07-04

ATEEL | ACEA

**Study on Future Sound Limit Values for Type
Approval for Vehicles of Category M & N**

Study Results | TF-VS | GRBP-75

February 2022



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Objective of the Study



Objective of the Study

Tasks

- Investigation of the current vehicle sound emission levels of category M and N vehicles
- Evaluation of the potential of limit value reductions in UN Regulation No. 51 in terms of road traffic noise reduction
 - Estimation of technical feasibility of the required measures
 - Estimation of effects under real road traffic conditions (transferability)
- Examination of the potential of alternative measures in terms of road traffic noise reduction
 - Comparison to the efficiency of limit value reductions under real traffic conditions



Objective of the Study

Study Approach

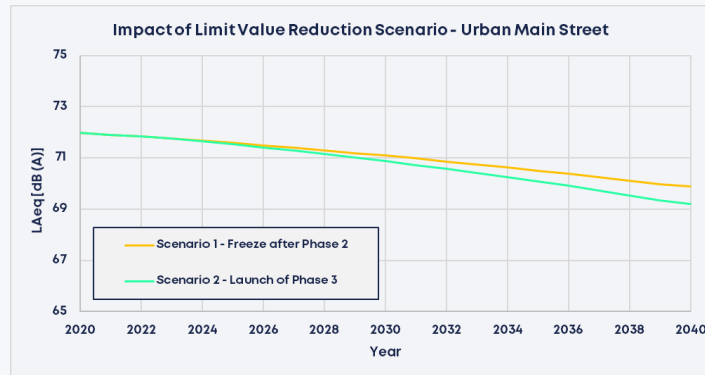
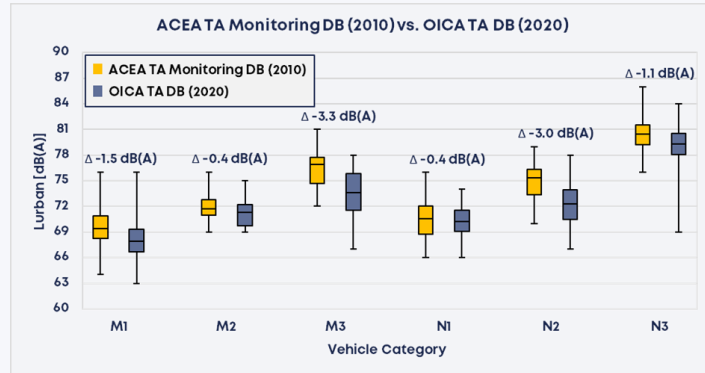
- Literature research (old and recent studies, state of the art technology, simulation of traffic noise methods ...)
- Type Approval Database analysis (ACEA Monitoring DB 2010 vs. OICA TA DB 2020)
- Vehicle /Tyre Industry consultation (questionnaire and interviews)
- Development of calculation tool based on TA data, registration data and literature research
- Impact analysis of various vehicle measures and alternative measures on real traffic

Key Findings



Key Findings

What is the current status quo in terms of vehicle sound emissions?



Sound levels of all vehicle categories have decreased over the past 10 years:

- Various contributing aspects, e.g. emission standards, technology, testing method, limit values

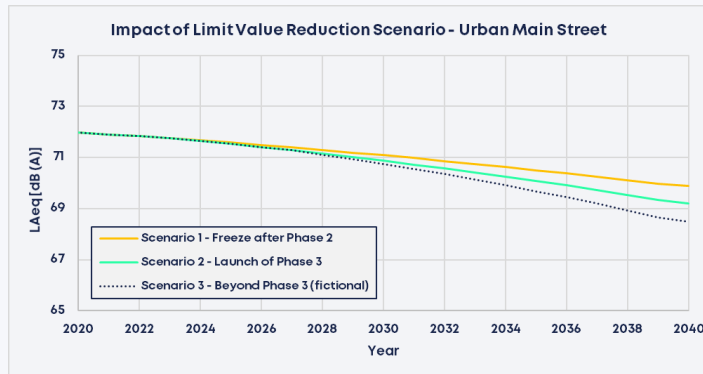
Slow improvement of overall sound level is expected for future years in consequence of UN R51 limit phase 2 & 3:

- Slow market penetration rate of new vehicles replacing older (=louder) vehicles → time delayed effect
- Phase 2 expected improvement of 2.1 dB(A) until 2040, even without further improvements on vehicles or tyres
- Phase 3 expected further 0.7 dB(A) improvement in 2040



Key Findings

What are the technical opportunities and the impact to overall sound level for a limit value reduction beyond phase 3?



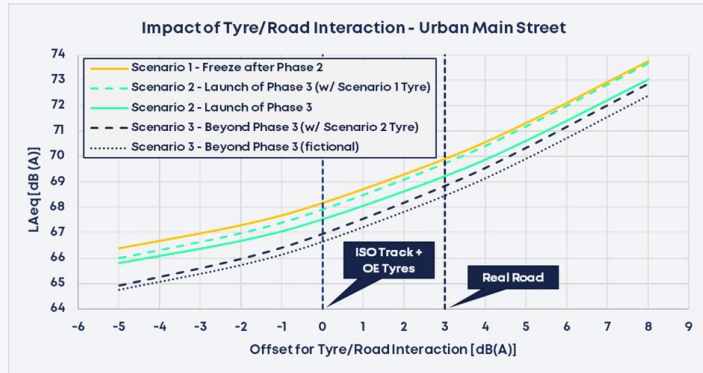
With current technology, a reduction beyond phase 3 is unfeasible and the theoretical benefit would be insignificant:

- Tyres increasingly become the dominant partial sound source under TA conditions for majority of M1 and N1 vehicles
- No improvements expected from the tyres to achieve limits beyond phase 3 due to unacceptable trade-offs regarding safety performances
- No improvements expected from powertrain for vehicles tested according to subparagraph 3.1.3.1 (passenger car principle)
- Minor improvements expected from powertrain for vehicles tested according to subparagraph 3.1.3.2. (truck principle)
- Beyond phase 3 theoretically expected improvement of further 0.7 dB(A) in 2040



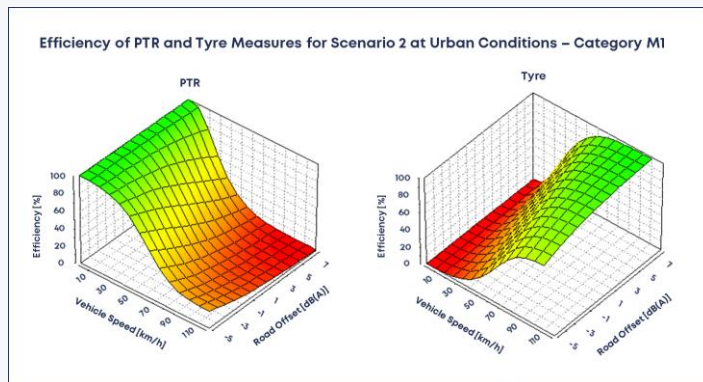
Key Findings

Why is the impact of limit value reductions on the overall sound level of real traffic so marginal?



Poor transferability of type approval results into real traffic:

- Rolling noise typically increases under real road conditions (road surface type, louder tyres, meteorological conditions)
- Variable driving speeds in real traffic
- Only new vehicles impacted by limit value reductions
- Numerous new vehicles already show compliance towards phase 3 limits



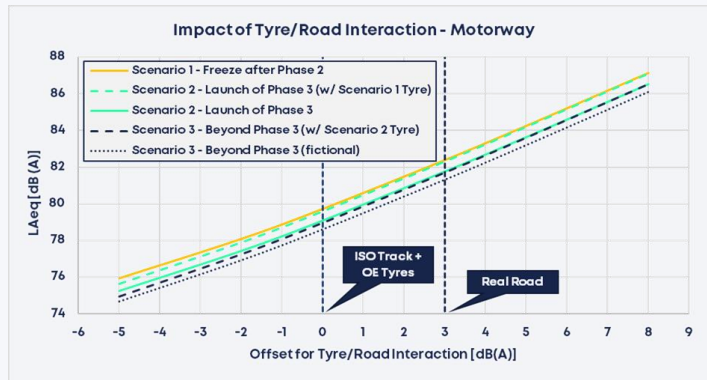
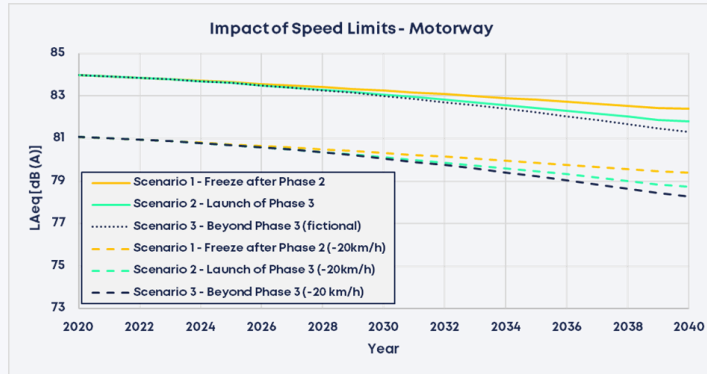
Low efficiency from powertrain improvements:

- Powertrain contribution only dominant at lower driving speeds
- Resulting improvements only visible at lower driving speeds (e.g. residential areas) and in combination with optimised tyre / road interactions



Key Findings

What improvements can be realised by implementing alternative measures?



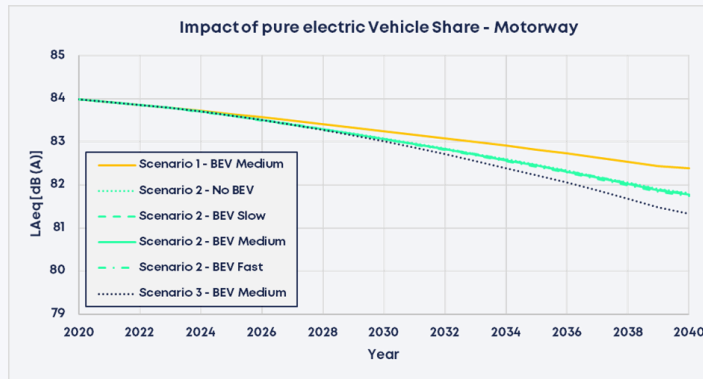
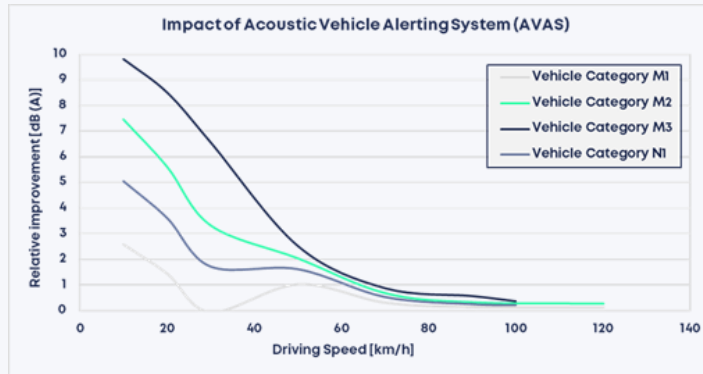
High efficiency of alternative measures:

- Lower speed limits (-20 km/h) resulting in reduced sound level:
Motorway: ~ 3.0 dB(A)
Urban main street: ~ 3.8 dB(A)
- Silent asphalt (-8 dB(A) vs. real road) resulting in reduced sound level:
Motorway: ~ 6.6 dB(A)
Urban main street: ~ 3.4 dB(A)
- Effective for all vehicles on the roads, not only new vehicles
- Immediate effect, no time delay



Key Findings

What potential can be realised through electromobility?



Electric vehicles with limited potential vs. ICE vehicle:

- Biggest improvements in residential areas (at lower driving speeds minimising powertrain dominance)
- Low /no improvements at higher driving speeds (no reduction on tyre sound)
- Proven solution for vehicles operating in urban and residential environments, e.g. city busses and delivery vans
- No solution for vehicles operating mostly on motorway, e.g. long-haul coaches, heavy commercial trucks
- AVAS configuration for M1 could lead to deterioration of benefits at low driving speeds

Recommendations



Recommendations

- Further reductions of limit values in UN Regulation No. 51 only achievable assuming improvements on the quietest available tyres, without sacrificing safety performance attributes
- Before determining new limit values, the improvements achieved by limit phases 2 and 3 should be evaluated in real traffic after the compliance of a sufficiently large proportion of the fleet is reached
- Numerous available alternative measures are proposed to significantly reduce the overall sound level (e.g. speed limits, silent road surface asphalt, geofencing, ...) impacting all vehicles with immediate effect
- A widespread use of quieter tyres would be recommended as improvements in real traffic would be immediately effective under all boundary conditions and for all vehicles
- The application of AVAS should be monitored in order to restrict configurations being louder than necessary
- Niche and special purpose/emergency vehicles shall not be neglected in new draft legislation in order to ensure their continued existence

Final Study Report



Final Study Report

- Duration: 01.10.2020 – 30.06.2021
- Completion date: 27.01.2022
- Full report with detailed explanations of presented findings and conclusions
- Further investigations such as:
 - Impact of RD-ASEP on real traffic sound level
 - Influence of measurement uncertainty on vehicle development
 - Benefits of geofencing
 - Classification of road noise in the overall context
- Published on ATEEL website (www.ateel.com): End of February 2022



Thank you for your attention!

**In case of questions or comments,
please do not hesitate to contact us**

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