Traffic Noise in Germany - Experiences from Berlin

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CONFERENCE TRAFFIC NOISE: AN OVER-LOOKED SOCIETAL CHALLENGE
Wednesday, May 18, 2016, København
- Impairments by noise in Berlin
- Noise Control in Germany: Shared Responsibility
- Principles of Noise Control Policy
- Reduction of motorised traffic
- Speed limit of 30 km/h on main roads
- New measure: Shared Space
- Road surfaces: repair and low noise surfaces
- Sound proof window programme
- Conclusions
Impairments: Noise mapping 2007 and 2012 in Berlin

Number of inhabitants in Berlin exposed to $L_{\text{night}} > 55$ dB(A)

<table>
<thead>
<tr>
<th></th>
<th>2007</th>
<th>2012</th>
</tr>
</thead>
<tbody>
<tr>
<td>road</td>
<td>339.400</td>
<td>296.300</td>
</tr>
<tr>
<td>rail</td>
<td>45.100</td>
<td>44.360</td>
</tr>
<tr>
<td>tram/metro</td>
<td>23.400</td>
<td>30.700</td>
</tr>
<tr>
<td>Tegel</td>
<td>12.600</td>
<td>8.900</td>
</tr>
</tbody>
</table>

Threshold of health risks; Medium term target in the Noise Action Plan of Berlin

Conference Traffic Noise, Copenhagen, 18th May 2016
Noise Control in Germany: Shared Responsibility

- **EU**: Sound emission regulations, Environmental Noise Directive
- **Federal Government**: Framework laws for noise control and city planning
  - Federal Roads, federal railway lines (noise remediation programs): Berlin: urban motorways
- **Federal States (Bundesländer, among them Berlin)**
  - State roads
  - Behaviour-related noise
- **Cities (among them Berlin)**
  - Urban planning and land use
  - Urban roads
  - Noise action plans (NAP): Berlin NAPs 2008 and 2013-2018
  - Public transport
  - Procurement (low noise products)
Principles of Noise Control Policy

- **Integrated** environmental approach
- **Ranking of instruments and measures:**
  1. **Reduction of the private motorised traffic**
     for climate protection, air pollution and noise control, road safety
  2. **Reduction of the sound emissions**
     - Speed limits
     - Low noise road surfaces
     - Electrically driven vehicles (busses – see annex, lorries)
  3. **Reduction of the sound propagation** (e.g. barriers)
  4. **Sound insulation** of buildings (e.g. sound proof windows)
Reduction of motorised traffic in Berlin

- **City of short distances:** compression (innerurban development), mixed land use, polycentric city structure
- Promotion of **walking, cycling and public transport**
- **Restrictions** for cars:
  - Reduction of space
  - Parking management
  - Speed limits
Reduction of motorised traffic: Modal Share in Berlin

Modal Split of Journeys in Percent

- Berlin 1998: 25% Walking, 10% Cycling, 27% Public Transport, 38% Private Motor Vehicle
- Berlin 2008: 29% Walking, 13% Cycling, 27% Public Transport, 32% Private Motor Vehicle
- Berlin 2013: 31% Walking, 13% Cycling, 27% Public Transport, 30% Private Motor Vehicle
- Inner Berlin 2013: 35% Walking, 18% Cycling, 17% Public Transport, 29% Private Motor Vehicle
- Germany 2014: 21% Walking, 13% Cycling, 11% Public Transport, 54% Private Motor Vehicle
- Copenhagen 2011: 30% Walking, 20% Cycling, 33% Public Transport, 17% Private Motor Vehicle

Legend:
- Walking
- Cycling
- Public Transport
- Private Motor Vehicle
Speed limit of 30 km/h on main roads (T30-MR)

- Tempo-30-Zones for 72 % of the road net
- T30 MR on 12 % of the main road net (~ 1600 km)
- T30 at night for noise protection on 5 % of the main road net (see traffic sign)
- Reduction potential ($L_{\text{max}}/L_{\text{eq}}$ in dB(A)):
  - Asphalt: 5/3 dB(A)
  - Cobbles: 8/6 dB(A)
  - 100% compliance: further 2 dB(A)

- Example Uhlandstraße:
  - 13,000 vehicles per day
  - 2008: $L_{\text{night}} = 65$ dB(A)
  - 2012: T30, introduction of cycle lanes and improved road surface
  - reduction of $L_{\text{night}}$ by 5.4 dB(A)
New measure: Shared Space

- Figure shows the entrance of the zone
- Driveway is reduced to one third of the original space
- Installation of benches and playgrounds (see annex) with furnitures
- No parking allowed, only stops for delivery of goods
Road surfaces: repair and low noise surfaces

Section of the Berlin road map with „noisy“ surfaces:

- Yellow: + 1 to 2.5 dB(A)
- Red: + 3 to 4.5 dB(A)
- Brown: + 5 to 7 dB(A)

Planned road surface improvements:

- Light green: repair
- Dark green: low noise surfaces with $\Delta L = -1$ to 3 dB(A):
  - Porous mastix asphalt
  - Split mastix asphalt
  - Thin layer asphalt
  - Acoustically optimised asphalt LOA 5 D
Sound proof window programme

**Summation of**
- road traffic
- metro on viaduct

Blue dots in the map: levels exceed
$L_{den} = 70$ dB(A) or $L_{night} = 60$ dB(A)
*(short term targets in the Berlin NAP)*

- **Voluntary** programme (no legal claim)
- **Currently available means:** 670,000 €/year
- **Subsidy amount:** 90% of the costs, < 10,000 €/apartment
Conclusions

- About 11% of the inhabitants in Berlin are exposed to noise levels which cause health risks
- The Berlin Noise Action Plans are the most important instruments for noise control: they are based on an integrated approach and include the participation of the public (see annex: slide 17)
- Berlin could reduce the persons with road traffic night levels above 55 dB(A) by 43,000 in about 5 years
- Most important measures are
  - Speed limit of 30 km/h for main roads
  - Low noise road surfaces
  - Reduction of space for cars (cycle lanes, shared space etc.)
- Nevertheless progress is too slow (with 30 further years for reaching the medium term target). Main problem: insufficient financial means
Thank you for your attention!

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Risk of myocardial infarction due to road traffic noise

Road traffic exposition level $L_m$ (6-22 Uhr) [dB(A)]

Relative Risk

| vehicles/24h: | 300  | 3000 | 30000 |

Source: Babisch, UBA 2006

75 dB(A): Risk + 29 %
## Attributable Mortality (2004)

**European Region, High Income* (Population: N = 407 Millions)**

<table>
<thead>
<tr>
<th>Disease</th>
<th>WHO Polynomial $L_{den} &gt; 60$ dB(A) **</th>
<th>WHO Trend $L_{den} &gt; 60$ dB(A) ***</th>
<th>Update Trend $L_{den} &gt; 60$ dB(A) ****</th>
<th>Update Trend $L_{den} &gt; 55$ dB(A) ****</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hypertensive heart disease</td>
<td>---</td>
<td>---</td>
<td>1,332</td>
<td>2,574</td>
</tr>
<tr>
<td>Ischaemic heart disease</td>
<td>11,196</td>
<td>26,933</td>
<td>13,808</td>
<td>26,622</td>
</tr>
<tr>
<td>Stroke</td>
<td>---</td>
<td>---</td>
<td>14,592</td>
<td>27,892</td>
</tr>
<tr>
<td>Diabetes mellitus</td>
<td>---</td>
<td>---</td>
<td>2,979</td>
<td>5,713</td>
</tr>
</tbody>
</table>

**Total fatal cases:** 32,711 62,801

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* 25 countries (EU 27 = 27 countries)  
** WHO Burden of disease from environmental noise (2011), polynomial exposure-response curve, categorical analysis (Babisch, 2008)  
*** Continuous exposure response curve, trend analysis (Babisch 2008)  
**** Continuous exposure response curves, trend analysis (van Kempen & Babisch 2012), Babisch 2013 submitted, Sørensen et al. 2011, 2012
Results of the online survey in Berlin 24.01.-22.02.2013

Each tag corresponds to a complaint or a proposal
Total proposals in Berlin: 3003

Example Friesenstraße

- Tempo 30- bad compliance
- Cobbles in bad condition
- Street not in the noise maps (secondary road)
- Street with most complaints (121, due to an active citizens initiative)
### Noise reduction by speed limits

<table>
<thead>
<tr>
<th>Traffic calming Zone (walking speed)</th>
<th>Pass-by level $L_{\text{max}}$</th>
<th>Average level $L_{\text{eq}}$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Traffic calming Zone</td>
<td>Up to 6</td>
<td>Up to 4</td>
</tr>
<tr>
<td>Tempo-30-Zone</td>
<td>Up to 5</td>
<td>Up to 3</td>
</tr>
<tr>
<td>Main roads (compliance with Tempo 50)</td>
<td>Up to 5</td>
<td>-</td>
</tr>
</tbody>
</table>

Source: Schlussbericht Modellversuch Flächenhafte Verkehrsberuhigung 1992

Additional note: RLS-90 2.3 to 2.7 dB(A)
Pass-by level reduction by Tempo 30

- Cars: for constant speed rolling noise already dominant at 30 km/h ➤ now reduction for E-cars
- Cars: pass-by levels $\Delta L (50-30) = -7$ dB(A) ($L_{eq} - 5$ dB(A)) ➤ observe the speed limit!
- Vans: $\Delta L$ between 3 and 7 dB(A) ➤ driving behaviour!
Average speed before and after introduction of T30-MR without radar controls
Tempo 30 – dialogue displays

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Tempo-30 zones

Tempo-30-
Zone Berlin
Cobble speed bump
19 Main Roads: reduction of accidents by 10% (> reference streets)
UBA Texte 33/2015
http://www.umweltbundesamt.de/sites/default/files/medien/378/publikationen/texte_33_2015_tune_url_0.pdf

Theoretically: see Figure VCD (next slide): stopping distance for T30 13.3 m, reaction distance for T50 13.7 m
► Impact speed for T50: 50 km/h

Wissenschaftlicher Beirat for BMVBS (2010): Safety first—potentials for the increase of road traffic safety in Germany:
► „Introduce Tempo 30 as city compatible regular speed“
http://www.mobilitaet21.de/uploads/media/2010_07_Sicherheit_zuerst_M%C3%B6glichkeiten_zur_Erh%C3%B6hung_der_Stra%C3%9Fenverkehrssicherheit_in_Deutschland.pdf
Tempo 30: improvement of traffic safety

Quelle VCD:
Tempo 30 in Berlin: air pollution /shifting of traffic

- Reduction of air pollution by T30: Beussel- and Schildhornstraße (speed controls):
  - $\text{NO}_2$ between -3 and -15 %
  - $\text{PM}_{10}$: between -2 and 7 %
  - Elemental Carbon EC -21 %

- Traffic shift to adjacent streets has not been observed
The road traffic authority of Berlin has again to prove the request of a citizen to introduce road traffic law related measures (T30 at night etc.) „taking into account the position of the court“ (road traffic authority had rejected the request).

- Exposures 2003: 75/68 dB(A) day/night
- Evaluation of the exposures has – among others - to be based on the noise limits of the ordinance for new roads (59/49 dB(A) day/night for residential areas)
- Decision must be unbiased and rational
Stationary speed control T30

Stationary speed control in Hagnau, Bodensee T30 on B31
Ingolstadt Westliche Ringstraße
Zeitliche Entwicklung der Vorbeifahrtpegel $L_{50}$ km/h

- Referenzwert: 70,9 dB(A)
- -5 dB Linie
- Pkw MP 1
- Pkw MP 2

Development of pass-by levels as function of time (number of month)

Green line: reference levels

Average reduction for cars 7 dB(A)
Spielregeln in der Begegnungszone

- Die Begegnungszone ist eine Straße für alle.
- Alle haben Platz – Rad- und Autofahrende aber bitte nur auf der Fahrgasse.
- Parken ist hier nicht erlaubt. Halten nur zum Liefern und Laden.
- Sorgsamer Umgang mit Pflanzen und Straßenmöbeln erhöht die Aufenthaltsqualität in der Straße.

Berliner Begegnungszone


Wesentliche Elemente der Umgestaltung sind:
- Kennzeichnung der „Eingangsportale“ mit Stelen
- Anordnung einer Tempo-20-Zone mit eingeschränktem Halteverbot
- Reduzierung der Flächen für den fließenden und ruhenden Kfz-Verkehr
- Grün gepflasterte Begegnungsflächen
- Gestalterische Elemente an den Querungsstellen
- Herstellung zusätzlicher barrierefreier Querungsstelle
- Zusätzliche Aufenthaltsbereiche einschließlich Möblierung
- Maßnahmen zur Verlangsamung des Verkehrs

Vehicles and bikes only on the driveways
No parking allowed, only stopping zones for delivery
Speed limit 20 km/h
Reduction of the driveway area, installation of street furniture
Shared space – Berlin „meeting zones“: design
Low Noise tyres

- Tyre label (EU 2009)
- Comparison of two tyres which comply with the limits since 2016
  \[ \Delta L = -3 \text{ dB(A)} \]
- In addition: fuel saving
Electrically driven busses

Silent, zero-emission