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TUNE ULR
Technical and scientific support for the amendment of the
EU Environmental Noise Directive

Concise report

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1 Introduction

In accordance with Article 11 of the directive 2002/49/EC (‘Environmental Noise Directive’), the European Commission (COM) is presenting a report on the implementation of this directive. The content of this report includes suggestions for the amendment of the directive as well as approaches towards the further harmonization of the strategies and instruments for noise reduction in Europe.

The German Federal Environment Research Plan (UFOPLAN) proposal TUNE ULR (Subsidy File No. 3712 55 101) is intended to evaluate the existing knowledge and experience to be found in Germany, in regard to an efficient involvement in the consultations concerning the progress report and in a COM suggestion for an amendment directive based upon it, and in regard to an expedient implementation of the amendment directive. The following concise report documents the most important results contained in working package number 2, ‘Reductions in Speed.’

Reductions in speed and in particular 30-kph limits on main roads are planned in many places for different reasons, for example, to reduce air pollution, for a higher quality of life in the area, or to increase traffic safety. The subject is also of great relevance in many local towns and villages due to the high acoustic benefits in relation to the relatively low costs involved.

‘Noise’ maps were created in around 3,700 German municipalities (which is the equivalent of a third of all German communities) in the first stage of noise mapping based on the Environmental Noise Directive. Noise action plans were developed using these maps. The majority listed speed reduction as a noise abatement measure (apart from noise barriers).

At the same time this measure is very controversial in discussions among experts and in political and public circles. People cast doubt, in particular, on whether drivers will comply and therefore how effective the measure can be, which leads to uncertainties. Also the cooperation between the administrative planning departments on one side and the executive highway departments on the other does not work without friction in many cases.

This has been shown by previous experience with noise action planning to be above all due to insufficient legal framework conditions and controversial discussions on the effectiveness of these measures.

Against this background, the investigation here supplies further basics on responding to the issues of whether and, if necessary, under which basic conditions do 30-kph speed limits on main roads make sense and how can implementation be promoted in practice. It encompasses the following steps:

- Researching practical knowledge of existing 30-kph limits on main roads and processing this information systematically
- Supplementing already available or ongoing studies by essential components. This concerns the quality of the traffic flow and the opinion of affected residents.
- Presenting and evaluating legal framework conditions. The existing possibilities for action and the requirement to act on the part of those responsible for laws and regulations need to be demonstrated.
2 Available Practical Knowledge

2.1 Underlying data

The available literature was researched to gather studies and survey was conducted at the committee of traffic experts for the German Association of Cities on 7 October 2011. Half of the studies cited here were taken from an available evaluation carried out in Berlin.\(^1\)

The emphasis lies on empirical studies under ‘normal’ basic conditions, because they give more information on the actual effect than calculated models with general assumptions or studies under laboratory conditions. Therefore no studies that solely rely on assumptions and model calculations were taken into account. There were a total of 27 studies on traffic behavior on main roads with a maximum speed limit of 30 kph, 25 of which were from Germany and two from Switzerland.

2.2 Results

The analysis of the these studies on a 30-kph speed limit on main roads led to the following results:

- A reduction of the maximum speed allowed from 50 kph to 30 kph lead to reductions in the average speeds of up to 16 kph if no secondary measures were implemented. The drop was as much as 18 kph based on speed enforcement checks. It was above all the higher speeds that were reduced.
- Measurement results showed that the degree of compliance increased the longer the regulation was in effect. Follow-up measurements should therefore be made at the earliest six months after the new regulation and for longer periods of time.
- The observed average noise levels decrease by around one to four dB(A) after the speed limit is set at 30 kph.
- The available studies show a slight reduction in air pollution after the introduction of a 30-kph limit. However, we need to point out that the quality of the traffic flow presumably has a greater influence than the speed limit.
- The 30-kph speed limits in the investigated cases did not lead to any notable traffic displacement into other streets or to any significant worsening of the traffic flow.
- The studies tend to indicate neutral to positive developments in traffic safety.
- In the cases where local residents were surveyed, the reactions towards the 30-kph speed limits were mostly positive. With these 30-kph limits, those surveyed felt less bothered by noise than before, despite there being a relatively small drop in the noise level.
- The driving speeds started to drop noticeably due to digital displays, speed enforcement checks, the showing of the reasons for the speed limit, and the repetition of the signage.

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\(^1\) Senatsverwaltung für Stadtentwicklung und Umwelt Berlin/LK Argus, VMZ (ed.): Evaluation of a 30-kph speed limit on main roads in Berlin, March 2013.
Further influences that were expected, for example, through a road’s function as a connecting road or its cross-section layout, could so far not be proved.

To sum up, it can be said that according to the studies available, the positive effects of a 30-kph speed limit on main roads predominate. However, the studies vary in their objectives and their methods of investigation, meaning that not all results are comparable and transferable.

3 The Quality of the Traffic Flow

3.1 Underlying data

GPS-based test journeys were carried out on two main traffic routes in Berlin as part of the plan to examine traffic flow quality. Two typical 30-kph limits and the adjacent stretches of road with a speed limit of 50 kph were taken under scrutiny:

• Sonnenallee in the Neukölln district of Berlin (speed limit of 30 kph, Monday to Friday from 7 a.m. until 5 p.m.) and

• the route along Osloer Straße–Bornholmer Straße–Wisbyer Straße in the districts of Mitte and Pankow (speed limit of 30 kph, Monday to Sunday from 10 p.m. until 6 a.m.).

In the GPS-based test journeys, second by second data was gathered by equipment in a car following the flow of traffic, including the position along the abovementioned routes. Diagrams for journey speed and time along the test routes were generated on this basis, including the stop times. The evaluation gives reliable information on the speeds driven and the quality of the traffic flow.

3.2 Results

The establishment of a 30-kph speed limit reduces the speeds driven on the investigated routes, however to a lesser degree than the difference between the designated speeds might suggest: Vehicles in the 30-kph zones are six to seven kilometers per hour slower during the day and at night, ten to 11 kilometers per hour slower than with a speed limit of 50 kph. The \( V_{85} \) decreases due to the designated 30-kph limit during the day by eight to ten kilometers per hour and at night, by nine to ten kilometers per hour.

Two fundamental causes are discernable for the lower reduction when comparing the enforced speed limits of 30 kph and 50 kph:

- The maximum speed of 50 kph is often not reached above all during the day because of disrupted traffic flow.

- People more often exceed the maximum speed of 30 kph than that of the 50-kph limit.

Nevertheless, the measurement results clearly show that the higher and more ‘noisy’ speeds in particular are reduced by a 30-kph limit.

\[ V_{85} \] is the speed maintained by 85% of the vehicles.
During the day, the homogeneity of the traffic flow is clearly better in the 30-kph zones than in the 50-kph zones (Figure 1). The range of driving speeds decreases by 16 kilometers per hour, that is, from 44 kilometers per hour to 28 and from 49 to 33 kilometers per hour. At night, no fundamental differences in terms of the quality of traffic flow occur on the routes studied.

During the day in the 30-kph zone, the average speed of travel over the entire route, including traffic congestion and stops, is around seven kilometers per hour and at night up to six kilometers per hour under that for the 50-kph zone (see curves in Figure 2). The resulting losses in travel time at 30 compared to 50 kilometers per hour are two seconds per 100 meters during the day and at night between zero and two seconds per 100 meters.

The investigations also show that in addition to the designated maximum speed limit, other factors have a considerable, if not partly more significant influence, on the genuine speed of travel and the loss in travel time:

- Traffic signal progression in the 50-kph zones and in the 30-kph zones was set for a speed limit of 50 kph in the street sections investigated. Here we should investigate whether it is necessary to adjust the coordination of traffic lights. This would help improve levels of compliance.

- Flowing traffic in the 50-kph zone on Sonnenallee is often disrupted by double-parked cars. As a consequence the passing vehicles are unable to maintain the speed for traffic signal progression.

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3 The speed for traffic signal progression is defined as the speed at which the passing of a number of traffic lights along a street is possible without having to stop.
Figure 1: Distance-speed diagram for Sonnenallee, traveling to the southeast

- Speed limit 50 kph
- Speed limit 30 kph
Figure 2: Speed classes in the mid-range bracket, at chosen intersections on Sonnenallee, traveling to the southeast (daytime speed limit of 30 kph, above) and in Wisbyer Straße–Bornholmer Straße–Osloer Straße, traveling to the west (nighttime speed limit of 30 kph, below)
4  Opinions of Affected Residents

4.1  Underlying data

Parallel to the measuring of the traffic flow, residents along these routes in both the 30-kph and the 50-kph speed zone were surveyed. The aim of the survey was to show the subjective perception of speed behavior, noise pollution, and quality of living in connection with the designated speed limit.

A total of 2,596 surveys were distributed. 615 were completed and returned, which equals a response rate of 24%.

4.2  Results

Noise was considered a major problem by all those surveyed in regard to the streets in question. In particular, people with their living room or bedroom facing the road were greatly irritated. It is interesting to note that the connection with the room situation remains when evaluating the noise situation of the road in general. People whose room faces the road perceive the traffic noise as more disturbing, even when they are outside of their home. The noise pollution in the home obviously makes people more sensitive to the disturbance outside.

People with lower levels of education perceive the noise as less problematic than people with higher levels of education. Correlations between the assessment of noise and the access to vehicles, the age, or gender of those questioned either do not exist or are weak.

People who have their bedroom facing the street in a 30-kph zone find car, truck, or bus traffic noise less obtrusive, compared to people who have their bedroom facing a 50-kph zone. This effect (regarding the position of the living room) does not occur during the daytime. Here the high noise pollution presumably plays a role (also in the 30-kph zones).

All in all, the residents evaluate the 30-kph zones positively. 61% of those surveyed agree that it is “quieter with a 30-kph speed limit.” Barely one fifth of those surveyed are of the opinion that there is no difference between the 30-kph and 50-kph zone. Also, those responding to the direct question of measures to improve the situation in their street spoke out positively in regard to “(more) 30-kph zones.” A positive response was given especially by people who already live in a section of street with a 30-kph speed limit. Those living in 50-kph zones and car owners more often than not disapprove of 30-kph zones. Nevertheless, 56% of car owners believe that a 30-kph limit leads to quieter traffic.

However, other factors play a role in the positive evaluation of 30-kph zones also: 66% of all those surveyed agreed with the theory that a 30-kph speed limit makes traffic safer. The statement “pedestrians can cross the street better” also achieved a higher level of approval (63% agreed). On the other hand, only 36% of those surveyed believe that a 30-kph zone leads to more traffic congestion. People living in 30-kph zones are more likely to agree with the statement that these zones improve the overall situation than those living in 50-kph stretches of road (Figure 3).

The evaluation of the measures depends also on the level of personal irritation caused by noise. A 30-kph speed limit is considered positive particularly by those who feel disturbed by traffic
noise. In other words, people who do not feel disturbed by traffic noise have a tendency to believe less in the noise reducing effect of a 30-kph speed limit (Figure 4).

Figure 3: Assessment as to whether 30-kph speed limits lead to a general improvement of the situation in the street, according to place of residence

(More) 30-kph speed limits improve the situation

Osloer (50 zone) Wisbyer (30 zone) 10 p.m. - 6 p.m.

N = 107, 245, 128, 110

(More) 30-kph speed limits improve the situation

Sonnenallee (50 zone) Sonnenallee (30 zone) 7 a.m. - 5 p.m.

N = 107, 245, 128, 110

Do not agree
Do not agree so much
Sort of agree
Mostly agree
Completely agree
5 Legal Framework Conditions

The question as to how to deal with the proposal of a noise action plan (in German, Lärmaktionsplan) on 30-kph speed limits on main roads leads to controversial discussions when implemented. It is also due to the fact that the implementation of the Environmental Noise Directive (END) in Germany as part of the German Federal Emission Control Act leaves some central questions unclear and enforcement is deficient.

The fact that the German legislature and regulatory authorities have not yet clarified the issue in advance does not release the administrations and courts from implementing the noise abatement planning law in line with EU law.

The legislature has provided a coordination model for developing and implementing plans with the regulations on jurisdiction and the reference in Article 47(d) 6 to Article 47 6 of the German Federal Emission Control Act (in German, Bundes-Immissionsschutzgesetz). No authority has been tasked with the responsibility of developing and implementing plans. In fact, those responsible for planning (generally the communities/towns) and the expert authority for the individual measures (for example, the traffic safety department) have coordinated their efforts. For example, the legal demands for the planning found in the END and the German Federal Immission Control Act on one hand and the expert law in relation to the individual measures on the other need to be coordinated.

For the enforcement of speed limits, the usual basis of law established in Sect. 45 of the German traffic rules and regulations (in German, Straßenverkehrsordnung) foresee particular requirements to address the noise situation, further traffic-related requirements, and the
judgment of the expert authorities. There has not been a legal decision made establishing which entity shall decide on the requirements exist in the relationship between the body or person responsible for planning and the traffic safety department, as well as who exercises discretionary authority.

In practice, it has been assumed that the responsible authority does not necessarily have to enforce the planning regulation for a noise action plan; but rather it can exercise its specialized discretionary authority of its own accord. That contradicts the wording of Article 47 6 of the German Federal Immission Control Act and the precept of the effective implementation of EU law. It makes the body or person responsible for planning and has to fulfill the requirements in the END dependent on decisions of the relevant authorities that the former cannot sufficiently influence.

Actually, the present law based on a correct interpretation confirming to EU law states: The body or person responsible for the plan can set a speed limit with binding effect for the traffic safety department after the proper involvement of said department. However, the binding effect only comes into force if the noise action plan is legal. The body or person responsible for the plan has therefore to incorporate the demands of the relevant law, in this case the German traffic rules and regulations and serve the purpose of traffic safety contained in said rules and regulations. All the other requirements for generating the plan also have to be fulfilled (in particular the sufficient weighing up of the matter). When these requirements have been fulfilled, the relevant authorities are bound, both in view of the facts of the case (the relevant noise situation that allows a speed limit) (also: ‘the plan’s declaratory judgment’) as well as in view of the legal consequences. Their discretion is generally overruled, or reduced to zero. It only comes into being again in atypical situations not foreseen in the plan. In principle, the traffic safety department has to put into force the designated speed limit as foreseen in the noise action plan.

Clarity has still not yet been found concerning the coordination of the process. It is indisputable that the person or body responsible for the plan has to involve the relevant authorities in the planning. In practice it is to an extent even accepted that the inclusion of speed limits in the plan requires the understanding of the relevant authority. With this, the expert authority on its part could gain a veto position, which could make it more difficult, or even impossible, for the person responsible for the plan to fulfill planning duties and the achievement of the aims of the END. This practice is legally speaking questionable in view of the missing regulation for a requirement of consensus in law.

In so far as the person or body responsible for the plan still sees it fit to seek the agreement of the relevant authority, for example, because of the relevant administrative prerequisites in the prevailing German state, the authority’s specific requirements concerning the decision made on the agreement have to be observed. The noise reduction planning law further clearly enhances the importance of noise protection and the reduction of noise pollution compared to the concerns of the traffic. The relevant authorities have to also take into account within the framework of coordination whether a speed limit is the only fitting and goal-fulfilling measure that is available to the person or body responsible for the plan. If this is the case, they are not able to withhold their agreement.
Sect. 45(1) and (9) of the German traffic rules and regulations demand up until now a very high “intervention threshold”, such as a situation with considerable noise irritation, in order that a speed limit can be imposed. At the same time there is the consideration: Traffic flow and traffic safety have priority over the requirement of noise protection in Sect. 45(9) 2 of the German traffic rules and regulations (considerable increase in the general risk of interference with a legally protected right through traffic noise). This leads to a conflict of aims with the law on noise action planning. The reason being is that this requires exactly that for those areas in which a noise action plan is to be created. That the relevant dangerous situation required for the noise action planning, namely the noise irritation caused by traffic for residents, is to be reduced. The priority of the problem regarding noise on roads has without doubt increased due to the noise action plan. A ‘translation’ of this into figures is still outstanding. In the meantime the authorities, and if applicable the courts, must come up with a concrete definition. It needs to be reviewed case-by-case. Values required for orientation on the possible use of speed limits are to be found in the German Ministry of Transport’s guidelines on traffic noise protection on interstate roads under the national construction responsibility (German traffic noise law 97, version from 25 June 2010). They are 67 dB(A) daytime and 57 dB(A) at night for primarily residential areas.

6 Conclusion

In the majority of cases we investigated, a 30-kph speed limit is an effective measure to lower noise irritation. When one is set, the following aspects need to be observed:

- A 30-kph speed limit is also suitable for heavily frequented and/or multi-lane main roads in the downtown in general. Until now no correlation has been found between the degree of use and the function as a connecting road and the cross-section of a street.

- Digital displays, the showing of the reasons for the speed limit (for example, with additional signs indicating ‘noise protection’ zones), and the repetition of the road signs all work to lower the speeds traveled, in addition to speed enforcement checks by radar.

- The studies available show a high probability of a positive effect. However, detailed forecast of individual cases cannot be made. Therefore, it makes sense to conduct accompanying studies on effectiveness. For this reason, we should bear in mind that car drivers require longer periods to become accustomed to changes. Follow-up measurements should therefore be made at the earliest six months after the new regulation and for longer periods of time.

The binding effect of a legal noise action plan is stronger than is often experienced in practice. The body or person responsible for the plan (the village or community generally) can set a speed limit with binding effect for the traffic safety department when specific preconditions are met. These measures include, in particular:

- Proper involvement of the traffic safety department

- The consideration of the requirements under specialist law (here the German traffic rules and regulations) and the further requirements for developing plans (in particular, the sufficient weighing up of the matter)
Because the **legal implementation** of the Environmental Noise Directive does not yet contain a complete model that is ready to implement, some points need to be clarified by lawmakers, for example:

- The clarification of the areas of responsibility and the involvement of the relevant authorities. Further review needs to be conducted to find out under which conditions a consensus mechanism in favor of relevant authorities is possible, which is also constitutional and conform to EU law.

- We recommend incorporating the noise action plan into the German traffic rules and regulations in order to clarify the influences of the noise reduction law on traffic safety projects. In particular, the conflict in aims between Sect. 45(9) 2 of the German rules and regulations on traffic, with its special priority up until now given to the interests of traffic flow, should be changed in view of the increase in the importance of the interests concerning the reduction of traffic-related noise in the environment. In addition, we recommend establishing a corresponding adjustment of the reference to the noise action plan in the regulations on road and traffic juridical measures for the protection of the public from noise (Road Traffic Noise Protection Regulations, 2007).

- The guideline of values for orientation, which would act as triggering thresholds for certain measures such as a speed limit, would be helpful to administrations and courts. The values should enable prioritizing for certain windows of opportunity. The now common threshold values that require the use of planning cannot itself be used because its compliance with EU law is questionable. Last but not least, the protection of quiet areas supported in the Environmental Noise Directive (END) shows that the current threshold values are often too high.

There is further **need for research** into the effects of 30-kph limits on main traffic routes. The examples researched so far show positive effects. However, the studies available are not enough for a universally valid working prognosis due to the low number of sample surveys and the different methods of investigation. It would make sense to further investigate the following aspects:

- The creation of a German-wide databank with case studies, framework conditions, evaluation results, etc.

- Field studies to further research the influencing variable of speed behavior. The aim is the development of a criteria catalog with suitable framework conditions for the creation of 30-kph speed limits, in the form of a guideline for planning in practice.

- Development and testing of a standardized study design for accompanying effect analysis as a working aide for towns and communities that want to introduce 30-kph limits on main roads.