Qcity

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Quiet City Transport Newsletter

SIXTH FRAMEWORK PROGRAMME

Quiet City Transport

is an integrated research project partly funded by the European Commission under the 6th Framework programme. This four year research project which started in February 2005 has a budget of about 13.5 million Euros.

Objectives:

The aim of this project is to develop an integrated technology infrastructure for the efficient control of road and rail ambient noise by considering the attenuation of noise generation at source at both vehicle/infrastructure levels.

The activity will support European noise policy to eliminate harmful effects of noise exposure and decrease levels of transport noise creation, especially in urban areas, deriving solutions that will ensure compliance with the constraints of legislative limits.

A major objective is to provide municipalities with tools to establish noise maps and action plans (Directive 2002/49/EC) and to provide them with a broad range of validated technical solutions for the specific hot-spot problems they encounter in their specific city.

The involved cities are:

Amsterdam, Antwerp, Athens, Augsburg, Brussels, Göteborg, Malmö Nieuwpoort, Ostend, Stockholm, Stuttgart.

These cities are representative for actual city noise situations in Europe.

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EDITORIAL

Community noise is one of today´s most severe environmental pollutants, which makes noise induced annoyance an essential problem in our modern and complex society.

Our transportation systems consitute one of the major noise sources adversely influencing nearby residents. Only road and rail traffic noise will expose 20-30 % of European population to excessive noise levels [LDEN ≥ 60 dB(A)]. In terms of people affected and considering its total adverse effects, these forms in our opinion one of the more severe environmental problems of today.

Access to efficient mobility remains a basic human need and is an essential prerequisite in order to maintain a high employment and economic prosperity. Therefore it is essential to find technical solutions that ensure a high degree of protection against noise especially for residents in urban areas so that a high quality of the needed mobility can be maintained.

Preserving quiet areas and achieving high levels of health and quality of life are important objectives of the European Commission. In view of that the European Commission adopted an Environmental Noise Directive in 2002 to achieve comparable data and measures for all member states in order to assess and hopefully reduce noise within cities in the EU. In support to the directive the project "Quiet City Transport" [QCITY] provides tools to be used by the local authorities for evaluating noise maps and creating noise action plans. This is done by developing and disseminating a wide range of different solutions for specific hot-spot problems.

The QCITY research project started in February 2005. 27 partners all over Europe are participating in the project. The expertise of the partners covers both road and rail related technology. Public transport organizations and local authorities are also represented. This broad range of stakeholders ensures a successful result of the QCITY project .

In this first newsletter, the project partners would like to convey to the public some of the solutions and tools for noise reduction in urban areas as a result from the QCITY research activities.

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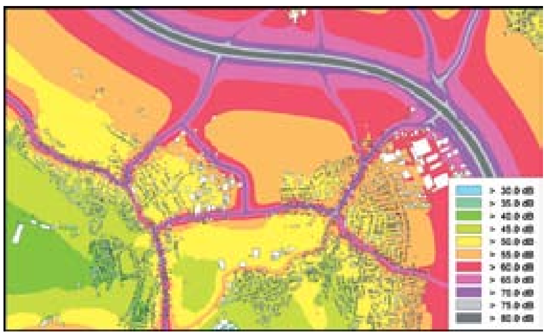
AUTOMATED HOT- SPOT DETECTION FROM NOISE MAPS

Within the Qcity project a Noise Environmental Rating System (NERS) for hot-spot detection was developed. Based on building specific noise level (i.e. LDEN) and the number of annoyed individuals per building a building, specific noise score can be determined. Therefore weighting functions will be suggested. Hot-spots are defined as small areas with a high number of unacceptable exposed persons, i.e. LDEN. Such spots may be found by calculating for all (partially overlapping) square areas of, e.g., size 100 m × 100 m, which together cover the total area of the municipality. Then, (clusters of) squares with high noise score are the hot spots.

The following picture shows a comparison of a clip of a Strategic Noise Map (LDEN) and detected hot-spots:



NERS allows not only defining the hot-spots. NERS is a very useful tool to quantify noise reduction measures with the noise score of the investigated area and is a basis for cost effectiveness studies different measures of an action plan.

NOISE EFFECTS CAUSED BY TRUCK RESTRICTIONS

In the framework of the Quiet-City project the implementation and validation of truck routing systems in the conurbation of Stuttgart are examined. In the process its potential regarding noise reduction is observed taking into account the population and its annoyance, the increase of mileage and economic effects such as expenses for the communes.

Using a traffic model and merging it with different scenario techniques it is possible to analyse the impact on the vehicle flow rate when blocking specific roads or entire districts and redirecting trucks.

The essential effects of bans on transit traffic can be subsumed as follows:

- Truck traffic relocates on non-blocked routes
- Due to the reduced amount of trucks on blocked routes more passenger cars shift to blocked routes
- Passenger cars and trucks shift to routes outside the cities that have been minor stressed before

The traffic volume determined hereby, provides the basis for the noise calculation which is executed according to the appropriate technical rules (European directive 2002/49/EC and its implementation in national (German) law (34.BImSchV) with use of noise indicators LDEN and LNight). The challenge is to develop adequate analysing methods in order to acquire feasible outcomes.

The accumulation and classification of effected areas in noise classes for instance does not deliver such outcome, since any change in the traffic flow and therefore in the noise emission does only have minor effects on the second building row and further. The overall sound level of the entire calculation area does not change notably. Therefore the examination of the potential of truck routing concepts should be additionally carried out considering the noise level alongside the most exposed façade which mostly faces the road and significantly is affected by changes of the traffic volume.

The results are benchmarked using the analysing method 'NERS' so it is possible to sum up the noise score within an area in one single numerical value. Thus the benefits of different measures become comparable.

First results of multiple scenarios show that there is noise reduction potential when applying specific traffic restrictions for heavy load. However each measure has to be investigated in detail as some measures might be counterproductive when being applied in combination with others.

In general the implementation of truck routing concepts is most fruitful when being designed and implemented regionally with the consensus of local communities. But also negative effects will be investigated. For the good of some areas, others will have to step back from an improvement or might even have to accept a limited change for the worse.

HYBRID ELECTRIC CARS AND TRAFFIC CONTROL CAN CREATE VIRTUALLY NOISE FREE CITY ZONES

One important aim of the EU directive 2002/49/EC is to improve the noise environment in cities. A study within the project "QCITY" has revealed the possibility of creating Quiet City Zones by combining quiet hybrid electric cars and traffic control, ensuring that only hybrid cars will enter the Quiet Zone by use of closing gates and/or by use of 3-4 EUR in charges per passage for noisy standard vehicles. The concept is to utilize the low noise emission from hybrid electric cars in electric mode, which will enable virtually noise free city zones. In order to fully utilize the lower driveline noise emission from hybrid electric cars the tyre/road noise should also be lowered. We have assumed 5 dB(A) lower tyre/road noise which can be achieved by e.g. selected low noise tyres in combination with low surface roughness pavements.

The concept of hybrid vehicles in quiet zones will affect traffic in many ways. Some people will switch to other transport modes to escape the closing gates or the fee. Others will choose another destination, while people normally travelling through the quiet zone may change route. Because low noise vehicles were exempted from the fee, people will probably also buy their own hybrid electric car, which in the long term perspective will cause an even greater potential for utilizing the concept.

Traffic models were used to resemble the impact on traffic flow such hybrid vehicle zones might have, using a prediction system, modelling the travel demand and traffic flow of the entire Stockholm County.

Traffic flow data from each simulation were used as input for creating noise maps. Results reveal that when only quiet vehicles were permitted, the noise reduction within the zone is 12-16 dB(A) units. With a 3-4-Euro charge, the reduction is approximately 9-11 dB(A) units. The noise reduction is partly caused by reduced traffic flow inside the zone and partly due to the lower noise emission from the vehicles operating in the zone.

The study of the hybrid vehicle zones revealed a very attractive potential for creating a virtually noise free city environment. The concept should be further studied and applied.

The picture demonstrates a simulated Quiet Zone at Södermalm in Stockholm assuming that only hybrid electric cars with quiet tyres are allowed to enter the zone.

ANTI-NOISE BARRIERS FOR TRAMS AND TRAINS IN URBAN ENVIRONMENT.

In the framework of the Athens Tram extended Noise & Vibration Abatement & Monitoring Program and towards an effective rehabilitation of the urban acoustic environment, both a medium height transparent barrier and two types of low height absorbing barrier were installed and tested in situ, in order to evaluate the noise attenuation that could be achieved for the protection of adjacent sensitive land uses. The above tested barrier types were evaluated in a measurement campaign – organized and executed within the Qcity project, and the relevant conclusions regarding the achieved noise attenuations are presented hereafter:

The following conclusions regarding the achieved noise attenuation from low & medium height barriers for trams and trains are presented below :

- The **Medium Height Transparent Reflective noise barrier** in an "inox" steel structure encasing transparent ALTUGLAS EX SRD sheets of 20mm width is a highly aesthetic mitigation measure that can be easily incorporated in the urban context and can ensure an average insertion loss of approx **9 - 10 dB(A) ± 0,3 dB(A)** both for Leq & Lmax taking in to account possible minor back reflection effects. It is clear that the reflective barrier needs to be placed at a considerable distance (approx. 2 or 3m from the external rail of the network) in order to eliminate undesirable reflection effects.
- The **Low Height Absorbing noise barrier** (at platform level) can also ensure an important insertion loss both on the noise source & screening effect due to its sound absorbing capabilities. It was established that an average insertion loss up to **6.2 ± 2,5 dB(A)** for a speed range from 10 up to 40 km/h is ensured by the use of this type of low and absorbing barrier. However the tested prototype needs to be upgraded on the aesthetical level in order to facilitate the integration in the urban context in order not to create adverse population reactions.
- The **Low height barrier** based on crumb rubber also result in high insertion loss due to its sound absorbing capabilities. It was found that **an average insertion loss** of **5,9 ± 2,2 dB(A)** for a speed range from 10 up to 40 Km/h is ensured by the use of this type of low absorbing platform barrier. However the tested prototype needs also to be upgraded on the aesthetical & rubber crumb quality level in order to facilitate the integration in the urban context.

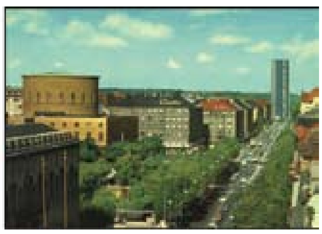
URBAN DEVELOPMENT AND NOISE REDUCTION

This report shows methods on how to combine the good sound environment with a sustainable and attractive city. The physical organization of the urban landscape is seen as the major long term key to reduce disturbing urban noise – and creating energy and time efficient urban areas. The urban density and layout defines transportation techniques which are realistic – from the dense and pedestrian public transportation city to the sparsely populated and car dependant suburban commuting system. KTH and the private company Acoustic Control has compared present traffic and noise levels in a suburban area north of Stockholm, the Järva Field, with two alternative scenarios, using "emme/2" software for traffic simulations and "CadnaA" software for noise calculations.

One scenario shows a traditional expansion of the present highway system around housing areas with no through traffic combined with noise screens. Another scenario shows an "urban highway" with high speed lanes partially below ground and low speed lanes on the surface and in existing housing areas. New combined housing/office/ shopping blocks function as noise screens towards the central park area and increase density to make new public transport systems along the "urban highway" economically feasible – thus reducing the main source of urban noise, the private car.

The project also presents holistic evaluation methods, real estate values connected to noise reduction measures and proposes a system for differentiated noise acceptance levels, connected to density, urban quality and different kinds of noise sources in order to make legally possible more dense new urban developments.

New urban street system in alternative 2 (red), added building blocks (yellow).



Official planning proposal, Swedish National Highway Authority – alternative 1

Model for suggested integrated urban highway (existing urban street) – alternative 2

partners:

Events related to Qcity activities

Inter-noise	**28.08 -31.08.2007**	**Istanbul**	www.internoise2007.org
	The 36th International Congress and Exposition on Noise Control Engineering will be attracting high quality research work from all the countries around the world and to produce valuable information on the global noise policies.		
CALM event	**1.10 – 2.10.2007**	**Brussels**	www.calm-network.com
	This conference entitled 'Research and strategies for less noise in Europe'. The conference will aim to present and discuss the current status and progress in environmental noise mitigation.		
Noise Seminar	**15.10.2007**	**Stuttgart**	www.qcity.org
	The training seminar will focus on noise mapping. Attendance is recommended for local authorities.		
Noise Seminar	**30.11. 2007**	**Stockholm**	www.qcity.org
	The training seminar will deal with action planning Attendance is recommended for local authorities.		
Acoustics 2008	**29.06 – 4.07.2008**	**Paris**	www.acoustics08-paris.org
	Acoustics'08 Paris conference and exhibition will host many interesting noise related meetings and events. Two major European conferences will be held jointly with Acoustics'08, the 7th European conference on noise control (EURONOISE), and the 9th European Conference on Underwater Acoustics (ECUA).		