

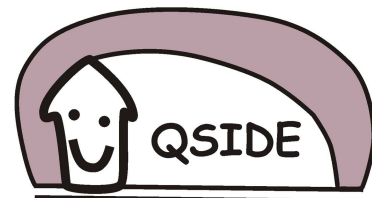


LIFE Project Number
LIFE09 ENV/NL/000423

Layman's Report

Reporting Date
15/11/2013

LIFE+ PROJECT NAME
QSIDE



The positive effects of quiet facades and quiet urban areas on traffic noise annoyance and sleep disturbance

Data Project

Project location	Delft (coordinating beneficiary)
Project start date:	01/09/2010
Project end date:	31/08/2013
Total Project duration	36 months
Total budget	€ 571.568
EC contribution:	€ 285.784
(%) of total costs	50
(%) of eligible costs	50

Data Beneficiary

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Project Website	http://www.qside.eu and http://www.qside.eu/proj

The project QSIDE: positive effects of quiet façades and quiet urban areas on traffic noise annoyance and sleep disturbance.

General description for a non-expert audience ('layman's report').

*Traffic noise in European cities is a major source of annoyance and sleep disturbance. A good approach to reduce the harmful effects of traffic noise is to create **quiet façades and quiet urban areas**. The project QSIDE provides strategies and tools to put this approach in practice.*

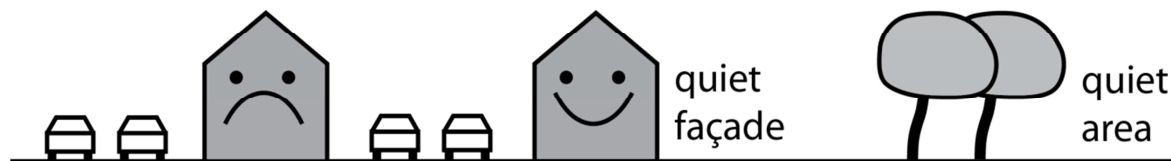
1. Outline of the project

The main objective of the project QSIDE is to demonstrate how European cities can effectively reduce harmful effects of traffic noise - annoyance and sleep disturbance - by offering two types of *refuges* to the inhabitants:

- *quiet façades of dwellings,*
- *quiet urban areas such as parks and quiet residential areas.*

For example, a quiet façade offers the possibility to choose a bedroom on the quiet side of a house, thereby reducing the chances on sleep disturbance by traffic noise. The refuges can be created in new urban areas, but they can also be created by modifying existing urban areas, for example by modifying traffic flows or by choosing specific orientations of houses with respect to roads.

In the project the general term *quiet places* was introduced, which includes both quiet façades and quiet urban areas. The figure below illustrates the beneficial effects of quiet places.



*Quiet façades and quiet areas are good for inhabitants.
The general term 'quiet places' is used for quiet façades and quiet areas.*

2. Project partners and funding

The project was performed in the period 2010-2013 by seven partners:

- TNO Delft, coordinator of the project
- Ghent University
- Chalmers University
- University of Gothenburg
- VTI Gothenburg
- city of Amsterdam
- city of Gothenburg.

The four involved cities are indicated on the geographical map shown below. The project was financially supported by the Life+ program of the European Community (project QSIDE, LIFE09 ENV/NL/000423).



3. Results of the project

Main results of the project are the following.

1. A website / document with recommendations and guidelines for EU cities on practical aspects of quiet places in cities.
2. A new calculation method for traffic noise levels at quiet places in cities.
3. Results of analyses of the effects of quiet places on inhabitants of cities in NL, BE, and SE, and considerations of possible calculation schemes to predict the effects.

The three results are briefly described in the following sections.

3.1 Result 1: document for EU cities

A document has been prepared with recommendations and guidelines for EU cities on practical aspects of quiet places. The document was primarily prepared as a website consisting of several webpages, but a single pdf-version of the complete website has also been prepared.

The website has the internet address www.qside.eu and will remain accessible after the end of the project. The website describes various aspects of quiet places, such as:

- indications of benefits of quiet places in terms of reduced annoyance,
- recommendations for (limiting) noise levels at quiet façades and in quiet areas,
- descriptions of other qualities than low noise levels at quiet places, such as vegetation or nice architecture,
- examples of quiet places, with videos and pictures,
- traffic noise control and quiet places in relation to sustainable urban planning,

- brief descriptions of scientific QSIDE work supporting the recommendations.

The intention is that cities will find material on the website that is helpful for the implementation of quiet places in the noise policy of the city. In this way, the website should be considered as a tool that supports the protection and creation of quiet places in cities, which is an important element of European environmental noise policy (see next section).

In April 2013 a QSIDE workshop was held in Lyon, where the website was presented to representatives of cities and to researchers of projects that are related to QSIDE.

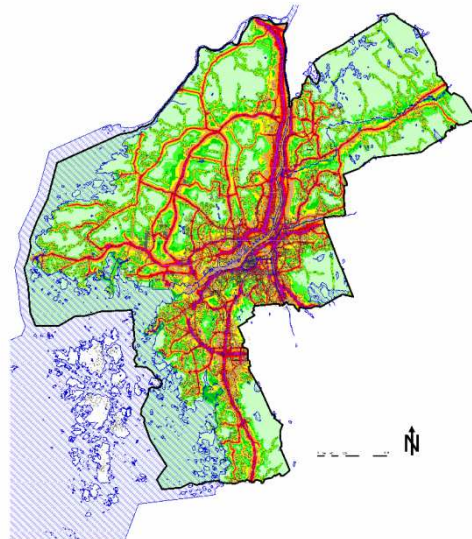
The screen dump below shows the top of the welcome screen of the website, including a pull down menu with various items.



Illustration: top of the welcome screen of the website www.qside.eu.

3.2 Result 2: method for calculating traffic noise levels at quiet places

Before explaining the new QSIDE calculation method, we first mention that EU cities regularly produce maps of traffic noise. An example is the noise map of Gothenburg in 2007 shown below. The colour represents the noise level in decibels. Noise levels are high (red) near busy roads and lower (green) in quiet areas. The noise maps must be calculated with methods indicated in a European document that is commonly called *Environmental Noise Directive* (2002/49/EC).

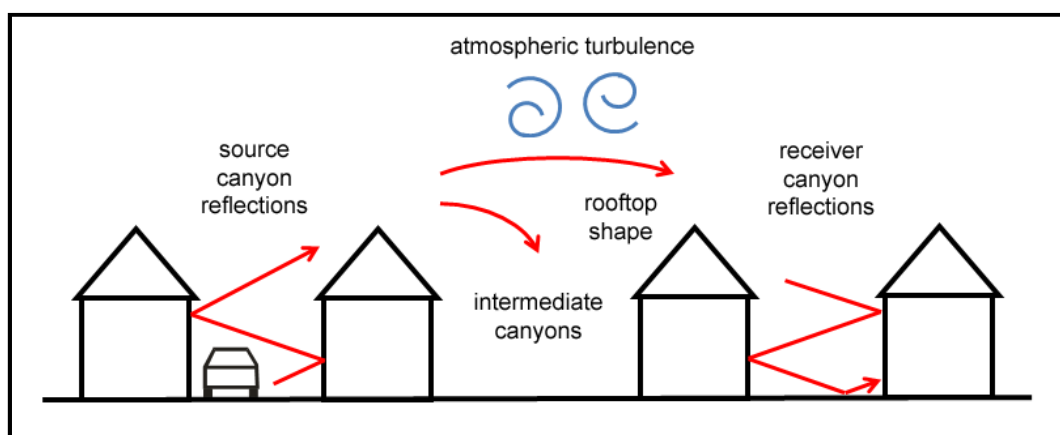


The Environmental Noise Directive also indicates that cities should provide information on *quiet places*, but quantitative methods for obtaining this information are not specified. This is a problem, since it is known that noise levels at quiet places are in general underestimated by standard calculation models – including the new EU calculation model Cnossos which is intended for the next EU noise mapping round in 2017.

As a first step to solve this problem, QSIDE partners have developed an engineering model for calculating noise levels at quiet places. The model takes into account:

- effects of multiple reflections between buildings in a street
- scattering of sound waves by turbulence in the atmosphere.

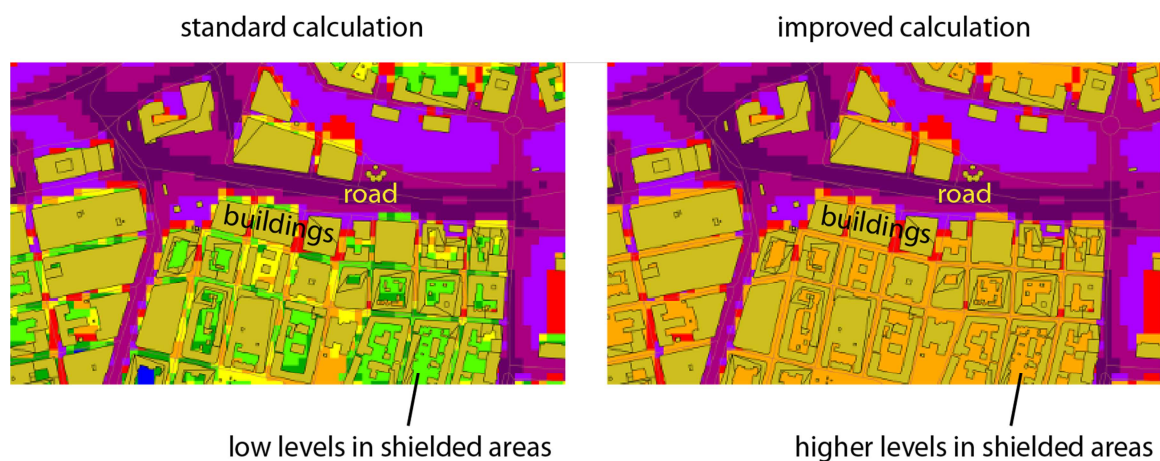
This is illustrated schematically in the figure below.



The QSIDE calculation model is an *extension* of standard calculation models such as Cnossos. This means that one should first calculate a noise maps with a standard method and next add an improvement calculated with the QSIDE model. Thus:

standard noise map + QSIDE correction = improved noise map

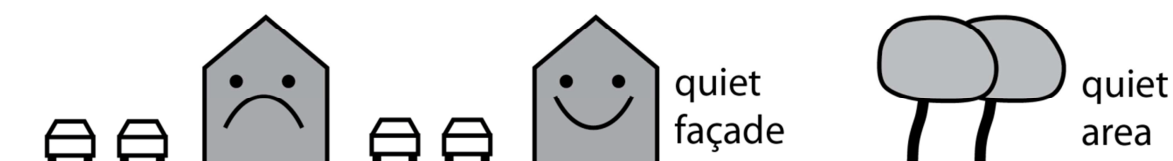
This approach is illustrated in the figure below, showing standard and improved noise maps of a small area of the city of Gothenburg. The noise map on the left was calculated with a standard model and the noise map on the right shows the improvement obtained the QSIDE model. On the roads and in areas near the roads, the noise levels are high (purple). In areas that are shielded by buildings (yellow), the standard noise map shows low levels (green) while the improved noise map shows higher levels (orange).



3.3 Result 3: method for estimating the beneficial effects of quiet places.

Annoyance and sleep disturbance by traffic noise in a city are conventionally estimated by means of exposure-response relations. For example, typically 25% of all people living in dwellings with a traffic noise level of 60 dB at the (noisiest) façade of the dwelling consider themselves as *annoyed* by the traffic noise. In QSIDE various possible methods have been explored for refining this approach, taking into account the beneficial effects of quiet façades and quiet areas.

The figure below illustrates the methods explored in QSIDE. The house on the left does *not* have a quiet façade, since there is traffic on both sides (front and back) of the house. The house on the right *does* have a quiet façade, since there is only traffic on one side of the house. Consequently, the people living in the left house are expected to be a bit more annoyed by the traffic noise, *on the average*, than the people living in the house on the right. This is illustrated by the smiling and non-smiling faces.



The explorations in QSIDE of the various possible methods are based on extensive studies of annoyance and sleep disturbance in five cities: Amsterdam, Antwerp, Ghent, Gothenburg, and Stockholm. Results of surveys in the cities have been related to noise levels at the most and least exposed façades, and also to quiet or green areas near the dwelling. Some of these analyses showed clear effects of quiet façades along the lines illustrated above, while other analyses showed no significant effects. Swedish and Dutch results indicated a significant effect of a quiet façade on traffic noise annoyance. Further, Swedish and Belgian results indicated that sleep disturbance is significantly affected by a quiet façade, and also by the location of the bedroom on the quiet façade.

Consequently, a single method for estimating the effect of a quiet façade on annoyance and sleep disturbance has not been formulated in QSIDE. However, the analyses and surveys have been described in various articles in scientific journals and at international conferences. People interested in these results can consult the journals and proceedings of the conferences.

4. Environmental impact of the project

The work performed in QSIDE should be taken into account in future updates of the Environmental Noise Directive. The project has produced new results and insights about quiet façades and quiet urban areas, which are important elements of the Environmental Noise Directive. The current version of the Environmental Noise Directive does not provide sufficient guidance concerning the methods how these elements should be addressed by the cities. Advantage should be taken here of the QSIDE results.

Partners of QSIDE are well-known researchers in the field of environmental noise control in Europe, and as such the partners will continue to promote the QSIDE results, also in relation to the Environmental Noise Directive and the new European calculation model Cnossos.