Mapping Service Environmental Noise Schleswig-Holstein

Friedhelm Hosenfeld[1], Ludger Gliesmann[2], Andreas Rinker[1]

Abstract

This contribution presents the "mapping service environmental noise Schleswig-Holstein": The main component of this web platform consists of a WebGIS with strategic noise maps ("Noise Atlas"). The system was developed in order to support the demands for the first period of the EC Environmental Noise Directive in 2007. The Noise Atlas was since then enhanced continuously, the additions include among others download options for action plans and integration of the well-known evaluation platform Disy Cadenza. Especially participation options for the concerned municipalities lead to improved data quality and acceptance of the web platform.

1. Overview

With Directive 2002/49/EC of the European Parliament and of the Council of 25 June 2002 relating to the assessment and management of environmental noise ("Environmental Noise Directive: END") the European Union defined a concept in assessing and reducing impact of noise (European Commission, 2002).

Main aims include:

- Determining pressure using strategic noise maps
- Assessing and if necessary avoiding or reducing environmental noise by action plans

In 2007 strategic noise maps had to be created and presented for the first time in order to comply with the directive's first period (2008 – 2013). In 2012 updated and enhanced data were made accessible for the second period (2013 – 2018).

In general evaluation and when required revising of noise maps and actions plans is scheduled at least every five years.

Making information about existing environmental noise publicly available and dissemination of noise maps and action plans to the public as well as public participation in action planning are the directive's key issues.

In Schleswig-Holstein the State Agency for Agriculture, Environment and Rural Areas (LLUR) is responsible for reporting the implementation of the Environmental Noise Directive to the national and European authorities and it supports the municipalities in creating their strategic noise maps and action plans.

The state agency was in need for a tool which supported the described tasks. The mapping service tool, designed for these requirements, is presented in this paper. All legal obligations for publishing the noise maps and action plans are met by the presented mapping service ("Noise Atlas SH") in Schleswig-Holstein.

[1] DigSyLand – Institute for Digital System Analysis & Landscape Diagnosis, Zum Dorfteich 6, D-24975 Husby, Germany, {hosenfeld|rinker}@digsyland.de, http://www.digsyland.de/

[2] LLUR - State Agency for Agriculture, Environment and Rural Areas of Schleswig-Holstein, Hamburger Chaussee 25, D-24220 Flintbek, Germany, Ludger.Gliesmann@llur.landsh.de, http://www.llur.schleswig-holstein.de/

2. Development steps

2.1. Initial development for the first reporting period

In 2007 it was soon clear that the requirements for informing the public and the needed participation would be met adequately using a commonly available WebGIS application.

The company DigSyLand was mandated to develop the Noise Atlas as a special version of the existing and successfully employed Agricultural and Environmental Atlas Schleswig-Holstein [2 – 4]. In addition to the presentation of noise maps the Noise Atlas (see 4.1) offered details about the municipalities and specific numbers of the people affected by environmental noise in those areas (see 4.3).

Furthermore each municipality received a user account which enabled them to provide the public with own information via the Noise Atlas platform and to download specific packages with noise simulation data concerning their communes.

2.2. Enhancements for the second reporting period

In 2011 further functions were integrated into the platform in order to support the implementation of the Environmental Noise Directive concerning the second period. This included various evaluation and correction functions regarding the input data for the noise simulation models, which were made accessible for the municipalities by means of the WebGIS (see 4.2). Other enhancements involved modules for uploading and presentation of action plans by the municipalities (see 4.4).

Because the State Agency had to maintain all contact and address data of the about 500 affected municipalities in order to fulfil reporting obligations (e.g. serial letters), create information brochures and support the municipalities it was evident to move all needed data consequently into the central database system. The widely-used evaluation platform Disy Cadenza was integrated as evaluation tool for certain information issues, e.g. to assemble mailing lists (see 4.5 and 4.6). Especially the extensive manual acquisition of indicator values demanded by the EU including scanning of non-digitized action plans could be transformed into an automatic reporting procedure supported by Cadenza, in which the municipalities upload the PDF files and submit the required indicator values.

The mapping service environmental noise is complemented with comprehensive information within the central government Internet platform.

3. Technical basics

The Noise Atlas web application was developed using the scripting language PHP, while the WebGIS module is based on the UMN mapserver. Data is maintained by an Oracle database management system (currently Oracle 11.2). Input data for noise simulation models are held with geometry attributes also within the Oracle database, while the strategic noise maps are integrated as shape files. Simulation input data include for instance speed limits, road surface, building types and noise reduction walls.

Evaluation duties are performed by Disy Cadenza Professional which offers direct access to the operational database.

4. Implementation of Noise Atlas modules

4.1. Presentation of strategic noise maps

The Noise Atlas offers all noise maps defined by the EU (e.g. 24 h road traffic or nightly road traffic noise) to be selected alternatively by the user. Results of the first period (computed 2007) can be compared with the results computed for the second period 2012. Using standard functionalities like arbitrary zooming, scale-selection or a printing option (see Figure 1) the simulated environmental noise could be visualized as demanded. Aided by a special search feature for municipalities the specific noise impacts for a chosen location can be exhibited.

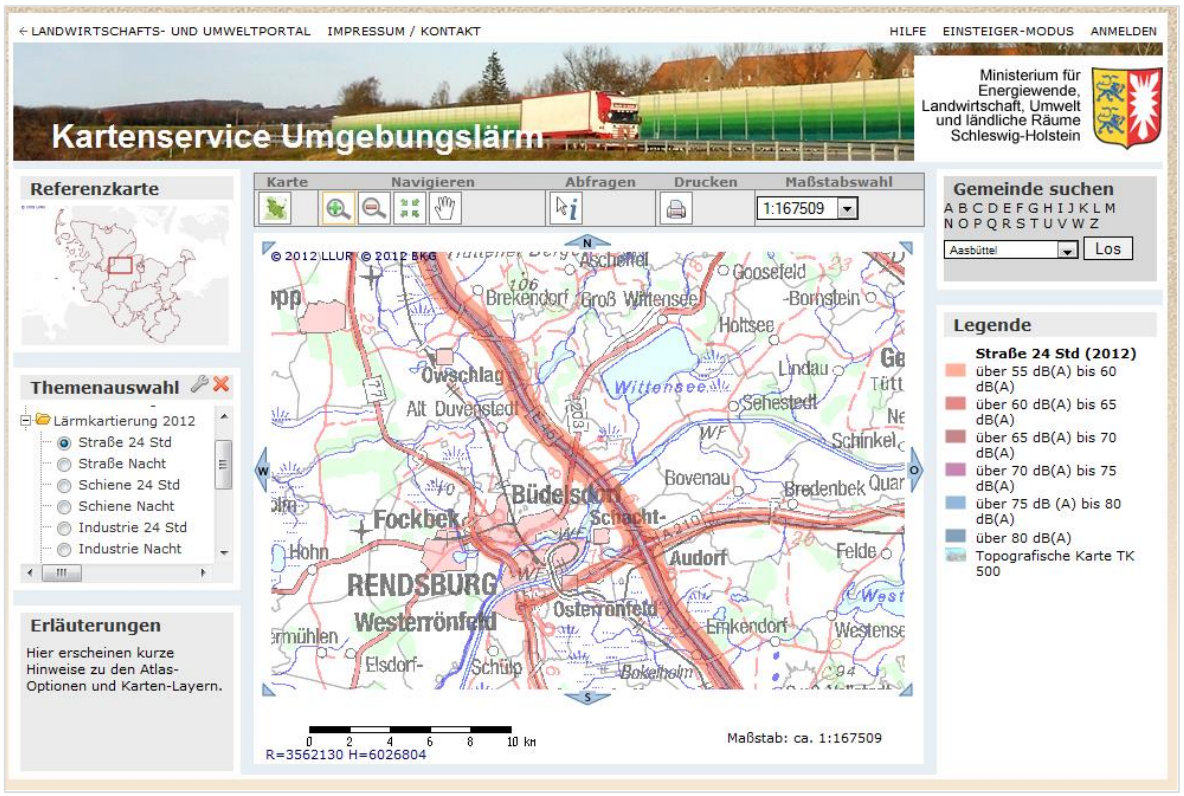


Figure 1: Presentation of strategic noise maps

4.2. Maps of simulation input data with editing facilities

In order to prepare the second reporting period of the EC directive in Schleswig-Holstein it was decided to enable the municipalities to review the input data for the noise simulation models. They should be facilitated to verify the data related to their municipal territory and to correct the data directly online: After selecting one data layer like e.g. speed limit, traffic intensity or building type, a mouse click on the road segment or on the building offers a pop-up window where the input data could be edited and supplemented with remarks (see Figure 2).

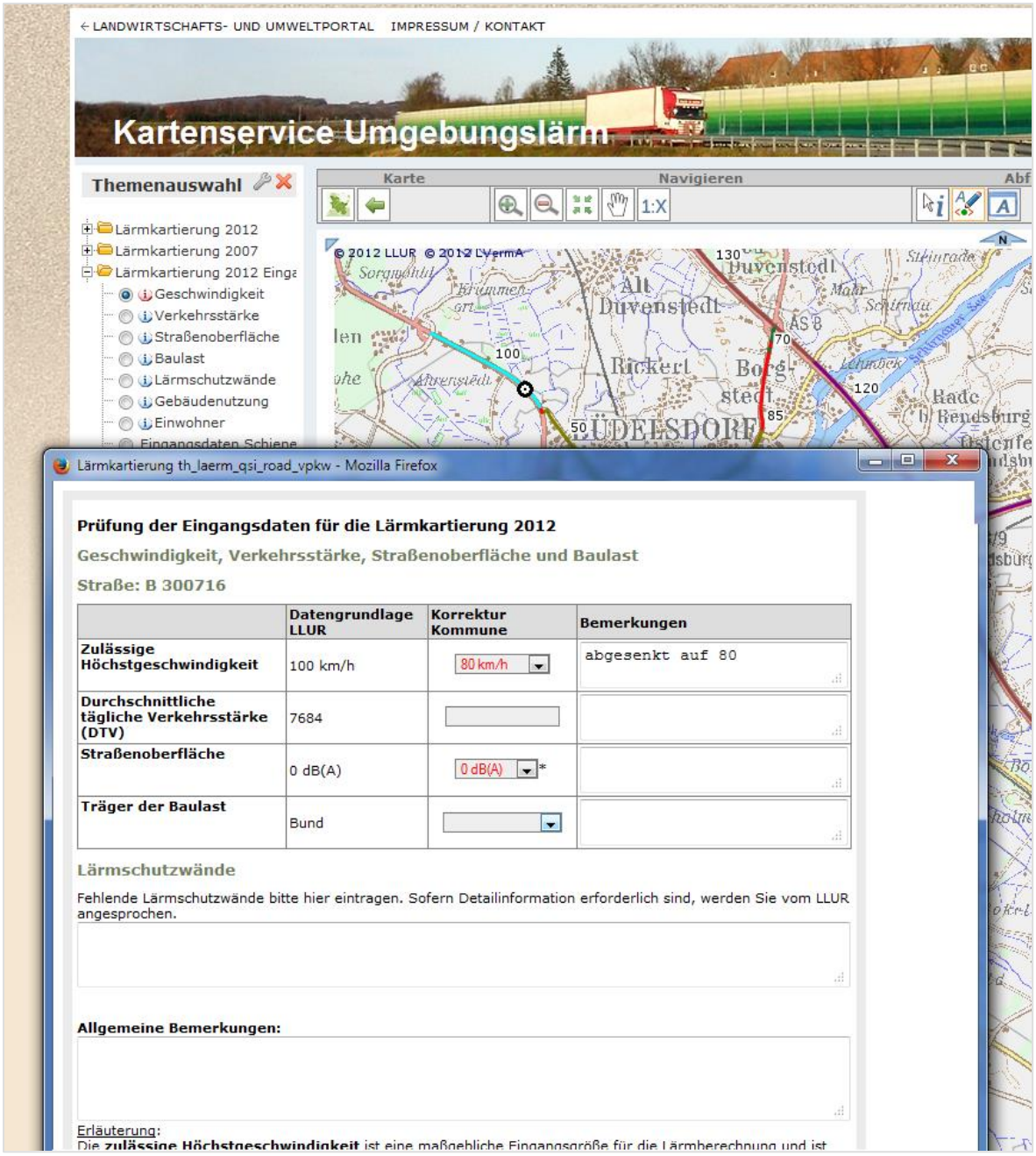


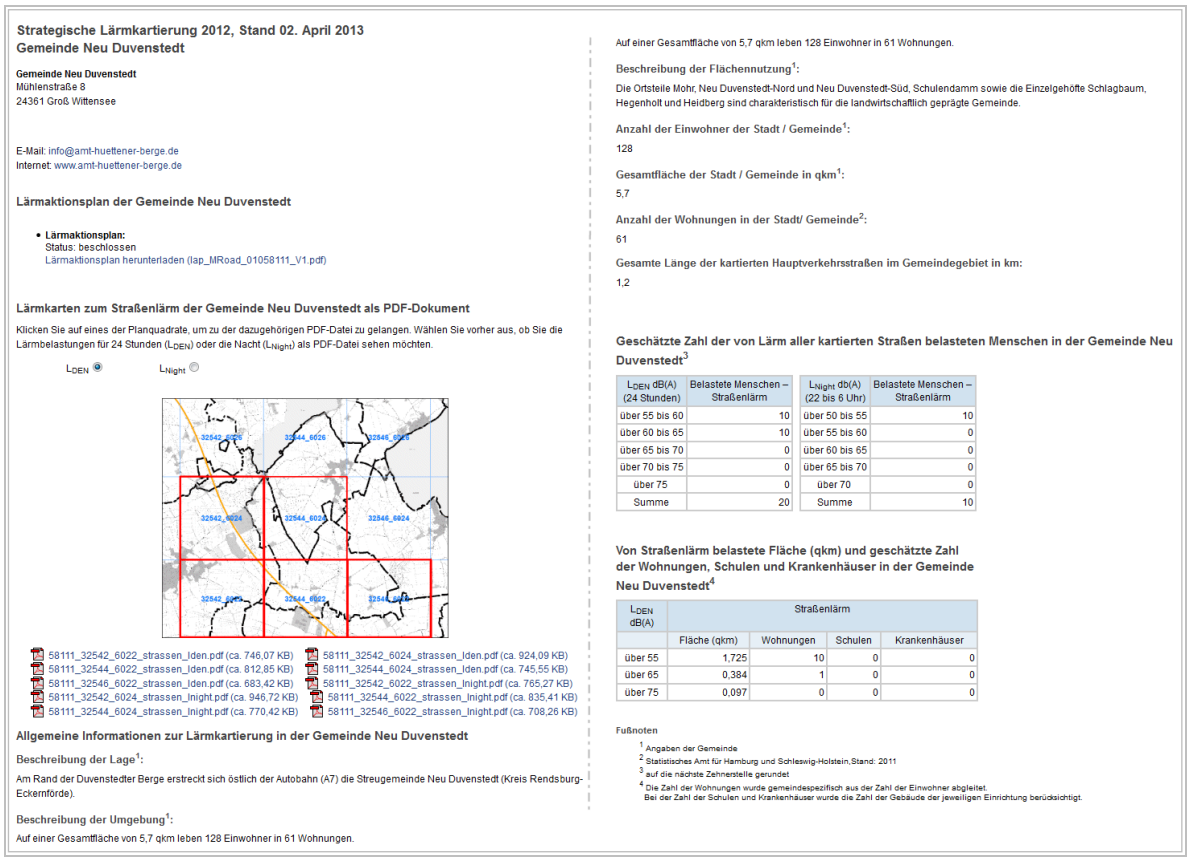
Figure 2: Editing of input data for noise simulation models (sample data)

4.3. Presentation of details about municipalities and affected people

Complementing the strategic noise maps for each affected municipality additional details could be retrieved which are supplementary legal elements of the noise maps. This includes basic municipality data but also tables containing quantities of affected people and buildings (see Figure 3).

In addition to the GIS based maps all noise maps generated by the company Lärmkontor GmbH, Hamburg covering each municipal area can be downloaded as PDF files, each extent can be selected on a clickable map (see Figure 3).

All required details are managed in the central Oracle database facilitating data updates uncomplicated and promptly. According to their user accounts the municipalities are able check and update their data and release it for publication.



Strategische Lärmkartierung 2012, Stand 02. April 2013
Gemeinde Neu Duvenstedt

Gemeinde Neu Duvenstedt
Mühlenstraße 8
24361 Groß Wittensee

E-Mail: info@amt-huettener-berge.de
Internet: www.amt-huettener-berge.de

Lärmaktionsplan der Gemeinde Neu Duvenstedt

- **Lärmaktionsplan:**
  Status: beschlossen
  Lärmaktionsplan herunterladen (lap_MRoad_01058111_V1.pdf)

Lärmkarten zum Straßenlärm der Gemeinde Neu Duvenstedt als PDF-Dokument

Klicken Sie auf eines der Planquadrate, um zu der dazugehörigen PDF-Datei zu gelangen. Wählen Sie vorher aus, ob Sie die Lärmbelastungen für 24 Stunden (L_{DEN}) oder die Nacht (L_{Night}) als PDF-Datei sehen möchten.

L_{DEN} L_{Night}

58111_32542_6022_strassen_lden.pdf (ca. 746,07 KB)
58111_32544_6022_strassen_lden.pdf (ca. 812,85 KB)
58111_32546_6022_strassen_lden.pdf (ca. 683,42 KB)
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58111_32544_6022_strassen_lnight.pdf (ca. 835,41 KB)
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Allgemeine Informationen zur Lärmkartierung in der Gemeinde Neu Duvenstedt

Beschreibung der Lage[1]:

Am Rand der Duvenstedter Berge erstreckt sich östlich der Autobahn (A7) die Steugemeinde Neu Duvenstedt (Kreis Rendsburg-Eckernförde).

Beschreibung der Umgebung[1]:

Auf einer Gesamtfläche von 5,7 qkm leben 128 Einwohner in 61 Wohnungen.

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Beschreibung der Flächennutzung[1]:

Die Ortsteile Mohr, Neu Duvenstedt-Nord und Neu Duvenstedt-Süd, Schulendamm sowie die Einzelgehöfte Schlagbaum, Hegenholt und Heidberg sind charakteristisch für die landwirtschaftlich geprägte Gemeinde.

Anzahl der Einwohner der Stadt / Gemeinde[1]:

128

Gesamtfläche der Stadt / Gemeinde in qkm[1]:

5,7

Anzahl der Wohnungen in der Stadt/ Gemeinde[2]:

61

Gesamte Länge der kartierten Hauptverkehrsstraßen im Gemeindegebiet in km:

1,2

Geschätzte Zahl der von Lärm aller kartierten Straßen belasteten Menschen in der Gemeinde Neu Duvenstedt[3]

L_{DEN} dB(A) (24 Stunden)	Belastete Menschen – Straßenlärm	L_{Night} db(A) (22 bis 6 Uhr)	Belastete Menschen – Straßenlärm
über 55 bis 60	10	über 50 bis 55	10
über 60 bis 65	10	über 55 bis 60	0
über 65 bis 70	0	über 60 bis 65	0
über 70 bis 75	0	über 65 bis 70	0
über 75	0	über 70	0
Summe	20	Summe	10

Von Straßenlärm belastete Fläche (qkm) und geschätzte Zahl der Wohnungen, Schulen und Krankenhäuser in der Gemeinde Neu Duvenstedt[4]

L_{DEN} dB(A)	Straßenlärm			
	Fläche (qkm)	Wohnungen	Schulen	Krankenhäuser
über 55	1,725	10	0	0
über 65	0,384	1	0	0
über 75	0,097	0	0	0

Fußnoten

[1] Angaben der Gemeinde
[2] Statistisches Amt für Hamburg und Schleswig-Holstein,Stand: 2011
[3] auf die nächste Zehnerstelle gerundet
[4] Die Zahl der Wohnungen wurde gemeindespezifisch aus der Zahl der Einwohner abgeleitet. Bei der Zahl der Schulen und Krankenhäuser wurde die Zahl der Gebäude der jeweiligen Einrichtung berücksichtigt.

Figure 3: Municipality details, numbers of affected people and PDF download (excerpts)

4.4. Documentation, upload and publication of action plans

Based on the environmental noise data the municipalities develop action plans in order to document noise reduction measures. The Noise Atlas offers modules for uploading action plans, for commenting it and to make the plans available for public download in combination with the municipality information presentation (see Figure 3). This service implements the reporting requirements defined by the Environmental Noise Directive. All PDF files documenting the action plans and additional remarks are managed by the database and protected according to access rights so that only released action plans can be downloaded by the public.

4.5. Administration module for maintaining address data

An administration module was developed in 2013 to support the State Agency in maintaining all data of municipalities and other authorities concerning the noise Environmental Noise Directive. For each reporting period for instance number of inhabitants, lengths of roads and railroads, mandated companies and similar details can be managed centrally.

4.6. Evaluation of action plans and municipal data with Cadenza

The in environmental informatics well-known evaluation platform Disy Cadenza is employed in order to analyse all noise related data mentioned in the previous sections as well as to fulfil reporting obligations. The noise evaluations are based on a central Cadenza installation which is already operated by the State Agency used by other departments. Cadenza supports direct access to the operational Internet database, so the data has not to be transferred into the State Agency's local network.

The evaluations include details about the municipalities' noise action plans concerning state of planning, costs and affected inhabitants but also various noise related data.

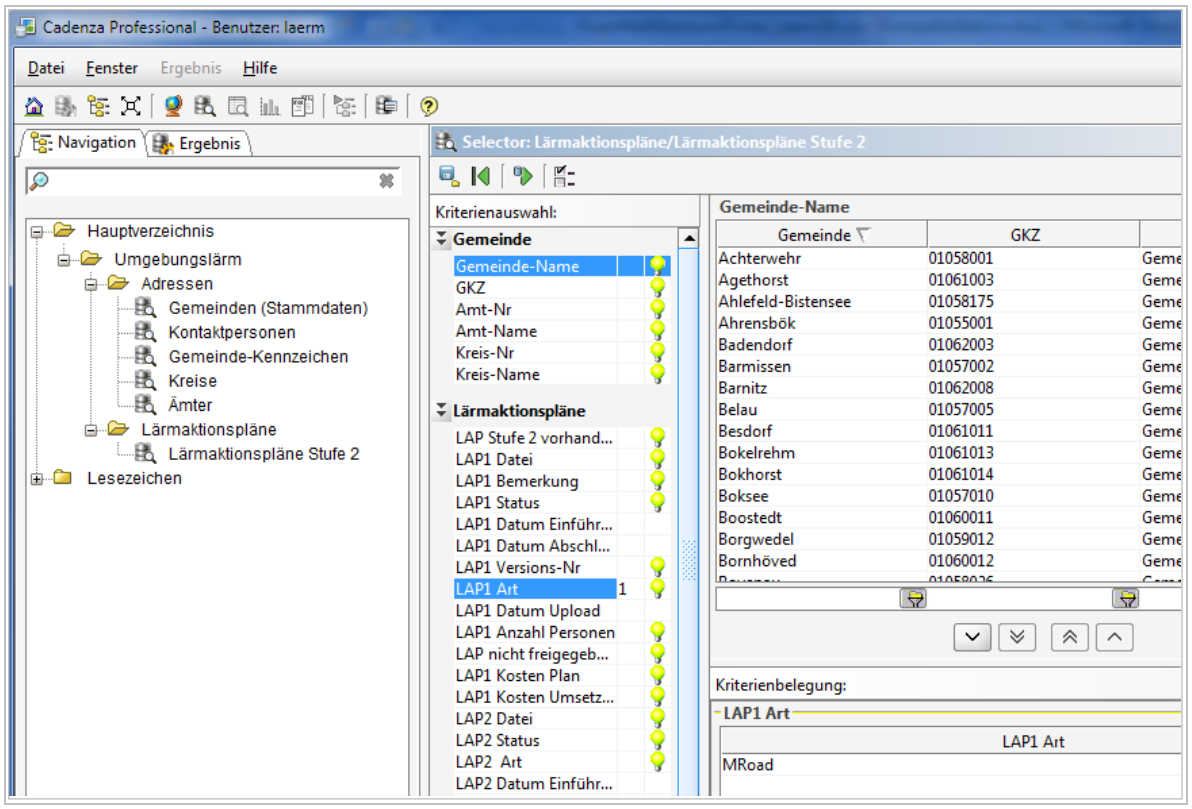

Figure 4: Evaluation of environmental noise data using Cadenza Professional

5. Conclusion and outlook

Since the first implementation steps were performed in 2007 in order to meet the requirements of the first period of the EC Environmental Noise Directive in Schleswig-Holstein, the "mapping service environmental noise" ("Noise Atlas") had been enhanced and expanded continuously. While the Noise Atlas was a helpful tool supporting the municipalities and state authorities preparing the first period, the application was further optimized since 2012 for the directive's second period.

Thus, all relevant data are managed consequently in the central Oracle database, while in the past Microsoft Access and Excel were used additionally. So, on the one hand all municipalities are provided with a common distributed web access to their data including editing functions while on the other hand the State Agency LLUR can perform administrative tasks and overall evaluations using Disy Cadenza.

During preparation of data for the second period the plausibility of the results and the noise maps were accepted by the municipalities much better than for the first period, because now they were provided with means to check and correct the input data. The State Agency had to deal with significant less inquiry and complaints regarding the noise data, which turned out to be a huge benefit.

Legal duties like publishing and reporting obligations could be achieved automatically and efficiently.

In future legacy data collected for the first period as well as quantities about affected people and similar data should also be made available for Cadenza utilising additional evaluation potential.

Some noise maps are already prototypically published as WMS service offering integration of these geodata to the municipalities and other interested people into their own GIS software in the future.

References

[1] European Commission: "Directive 2002/49/EC of the European Parliament and of the Council of 25 June 2002 relating to the assessment and management of environmental noise". 2002 Available: http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2002:189:0012:0025:EN:PDF (last visit: 22nd June 2014).

[2] Görtzen, D.; Schneberger, S. & Rammert, U.: "Schleswig-Holsteins Environmental Atlas for the Public and for Special Interest Groups". In: Minier, P. & Susini, A. (eds.): *Proceedings of the 18th Conference Informatics for Environmental Protection.* October 21-23, 2004. CERN, Geneva, pp. 634-640.

[3] Görtzen, D.; Rammert, U. & Bornhöft, U.: "Geo Data and Infrastructure provided by the Environmental Administration of Schleswig-Holstein". In: Wohlgemuth, V.; Page, B. & Voigt, K. (eds.): *Proceedings of the 23rd on Environmental Informatics and Industrial Environmental Protection: Concepts, Methods and Tools*. Berlin, 2009, pp. 369-376.

[4] Rammert, U. & Hosenfeld, F.: "Dynamic and Interactive Presentation of Environmental Information". In: Gnauck, A. & Heinrich, R. (eds.): *The Information Society and Enlargement of the European Union, 17th International Symposium Informatics for Environmental Protection*, Cottbus 2003, pp. 517-524.

Links (in German):

Environmental Noise Directive in Schleswig-Holstein (Umgebungslärmrichtlinie in Schleswig-Holstein): http://www.laerm.schleswig-holstein.de/

Mapping service Environmental Noise (Kartenservice Umgebungslärm): http://www.umweltdaten.landsh.de/laermatlas/