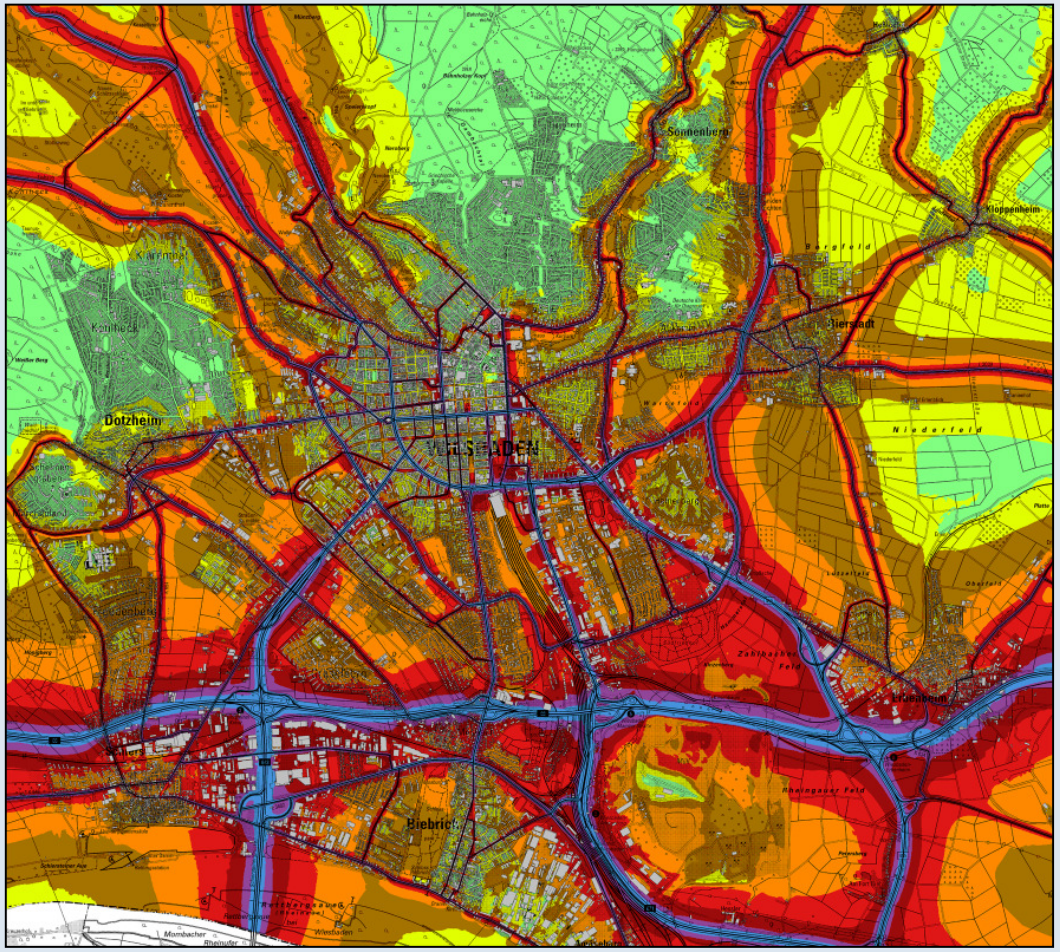
Noise action planning experiences from Germany

QCity presentation, Stockholm
November, 30th 2007

Markus Petz



ACCON GmbH Ingenieurbüro für Schall- und Schwingungstechnik
Gewerbering 5, 86926 Greifenberg
Tel.: 08192 - 99 60 - 0 • Fax: 08192 - 99 60 - 29 • E-mail: info@accon.de • http://www.accon.de

History

1992	Implementation of an obligation for communities for local noise mapping and action planning within the German law (Bundes-Immissionsschutzgesetz)
1992-2000	Some pilot projects with founding of ministries were done in some federal states of Germany
1998	ACCON was winner of a research competition with a proposal of a project development and implementation of a Noise Information System for the City of Ravensburg
2000-2002	ACCON builds up a Noise and Air Pollution Information System for the City of Augsburg
2000-2004	Pilot project "Noise Mapping and Action Planning" for the Filder region (with parts of the City of Stuttgart) according EU-Directive (not in detail)
2004-2006	Low Noise Routing of Heavy Traffic Concept for noise reduction
since 2006	Germany started with preparing Strategic Noise Maps according END by all communities or responsible authorities
since October 2007	Developing action plans for all main traffic sources (main roads, main rails, main airports) were started

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Federal states and agglomerations

Number of agglomerations

Nordrhein-Westfalen:	12
Baden-Württemberg:	**3**
Bayern:	3
Hessen:	2
Sachsen:	2
Niedersachsen:	1
Schleswig-Holstein:	1
Berlin:	1
Bremen:	1
Hamburg:	1

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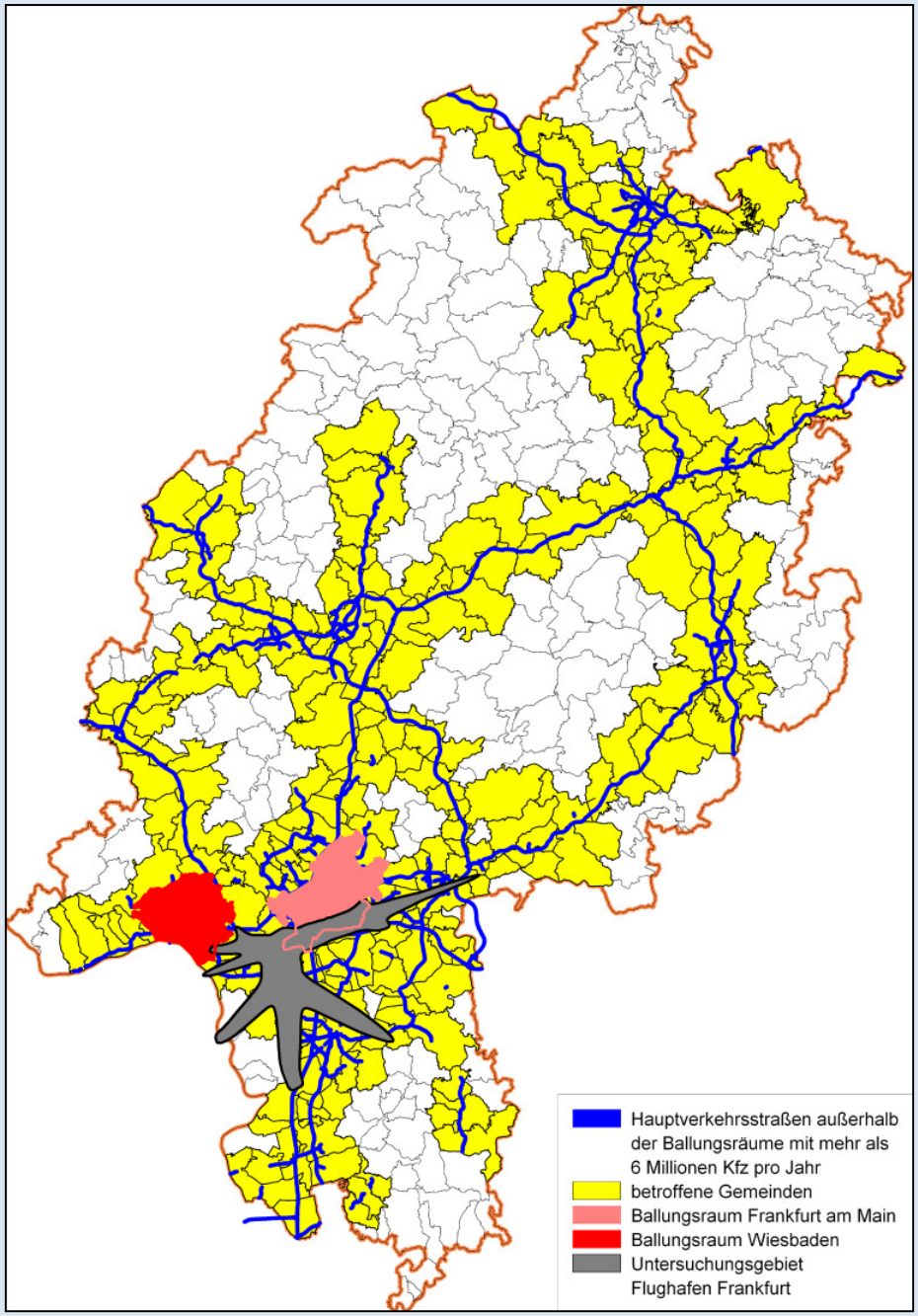
Example: Strategic Noise Maps for Hessen

(same procedure in most of the other federal states of Germany)

1. **Main roads outside Agglomeration (1.750 km; 229 communities)**
2. **Agglomeration Frankfurt (248 km² / 645.000 inhabitants; road / rail / industry**
3. **Agglomeration Wiesbaden (204 km² / 273.000 inhabitants; road / industry)**
4. **International airport Frankfurt ca. 450 km² / 350.000 inhabitants (L_{DEN} = 55 dB(A) / L_{Night} = 45 dB(A))**



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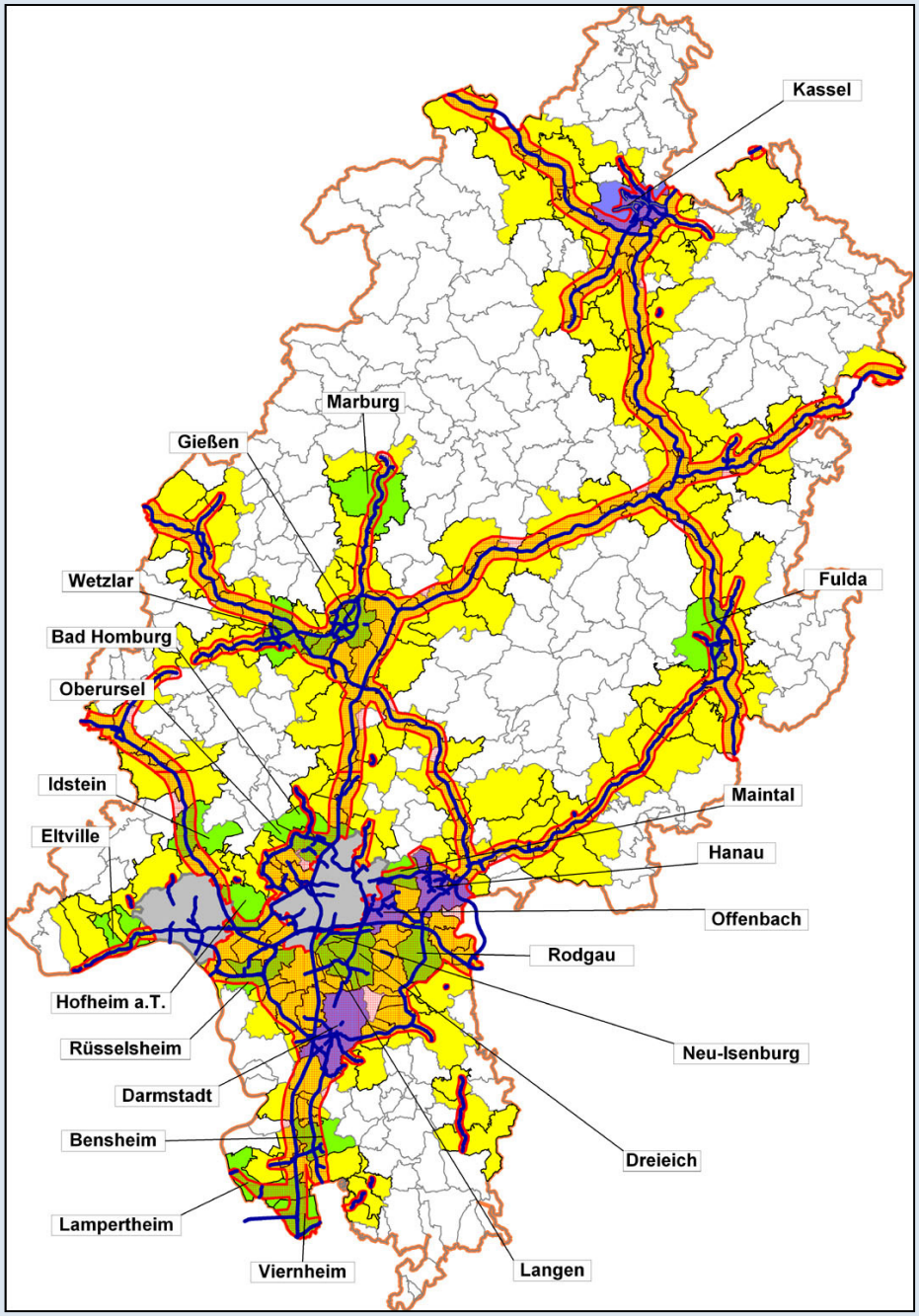
Investigations Main Roads

- all classified mainroads (BAB, B, L) > 6 Mio Kfz / a (DTV > 16.400 Kfz/ 24h) based on: statewide traffic counting in 2005 and additional traffic data from communities
- Area of investigation contour line L_{DEN} > 53 dB(A) / L_{Night} > 43 dB(A) calculated with free noise transmission
- 1.750 km roads (outside agglomerations)
- Investigated area: 4.500 km²



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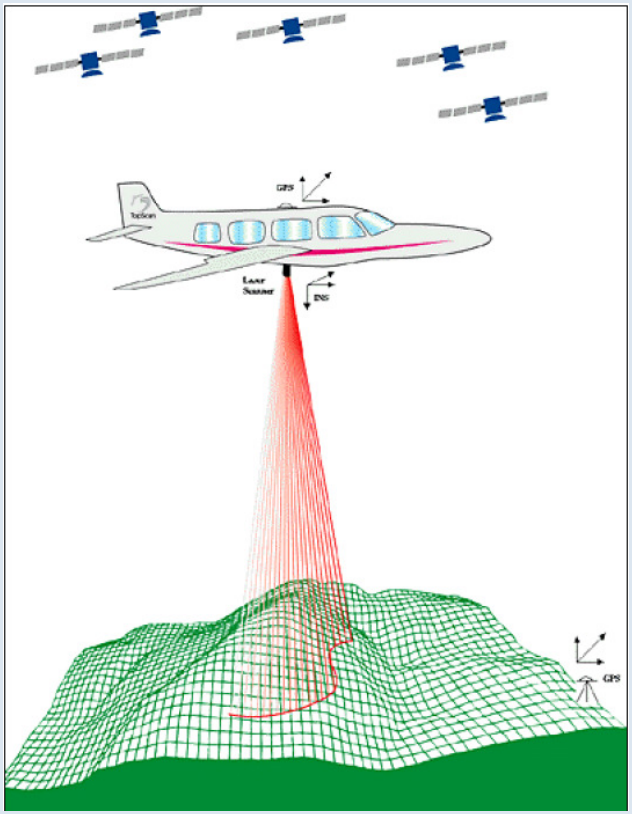
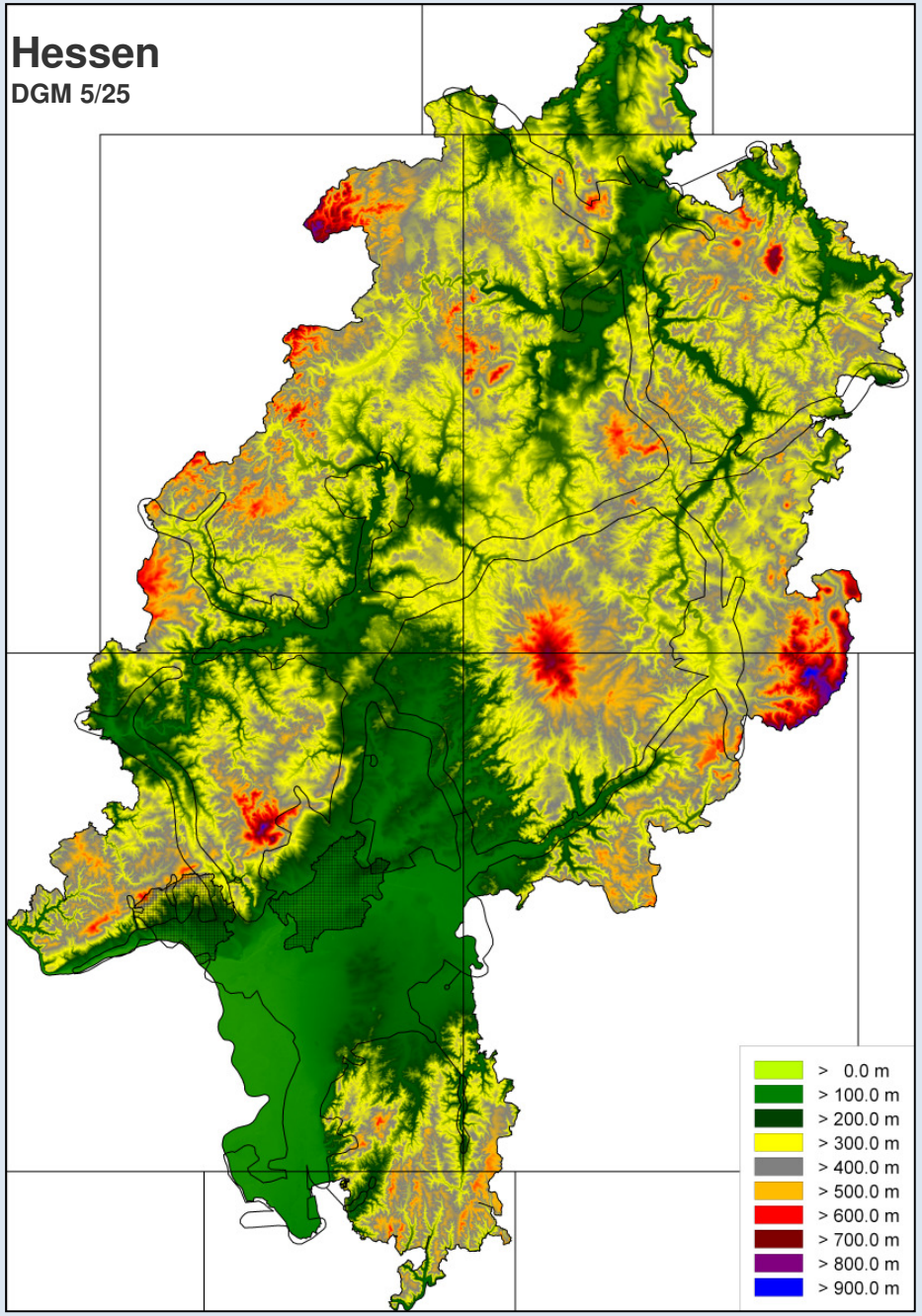
Digital ground modell

Examples





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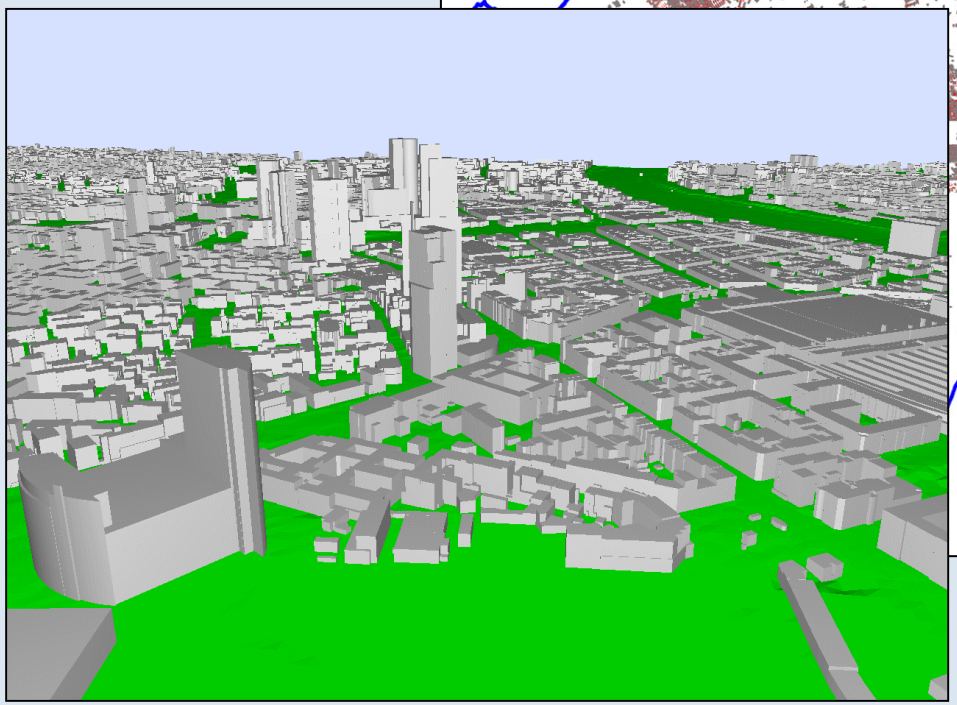
Building data

Examples

Agglomeration Frankfurt a.M.
ca 229.000 buildings
ca 65.000 residential buildings



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Inhabitants data

Example
Agglomeration Frankfurt a. M.

Adress points with
ca 664.000 inhabitants
from communal database

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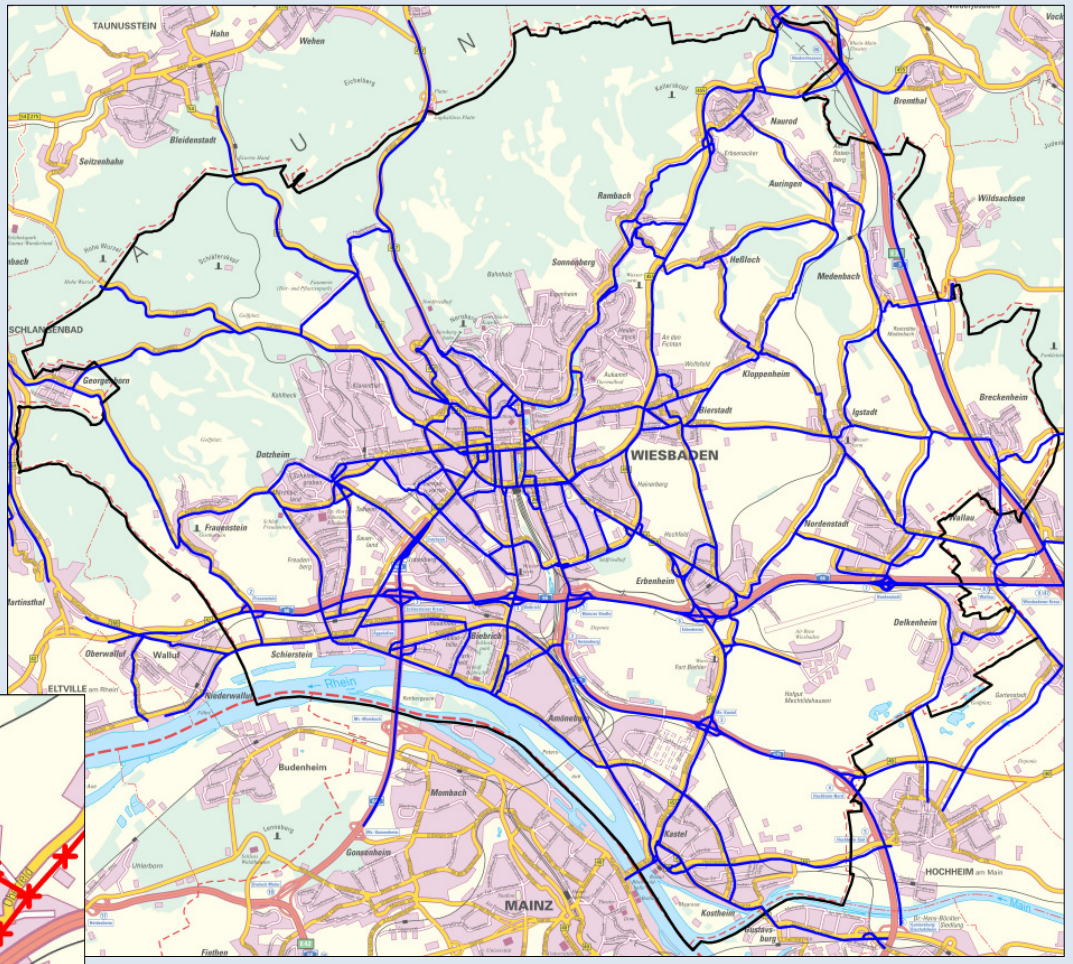
Road data

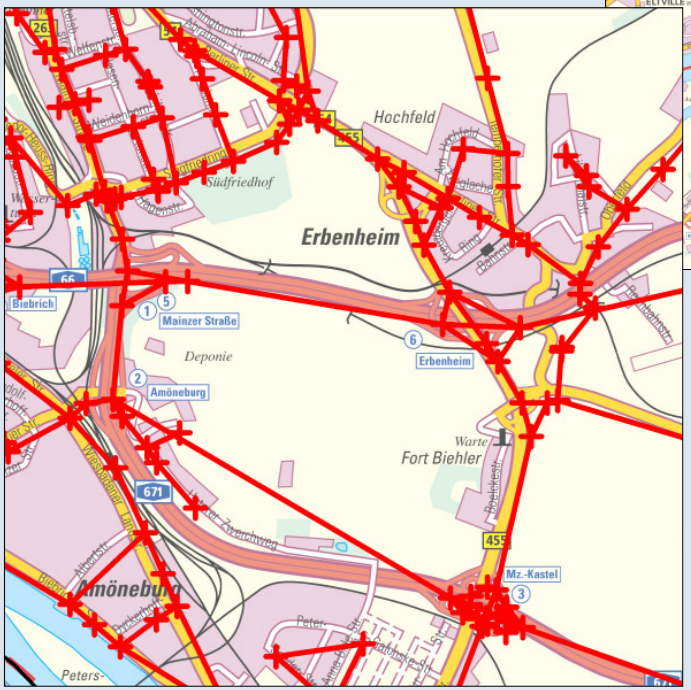
Example
Agglomeration Wiesbaden

Based on:
Visum-Data (traffic model),
Fa. BSV Aachen

approx. 360 km length

Criteria for noise mapping:
daily traffic > 3000 vehicle / 24h





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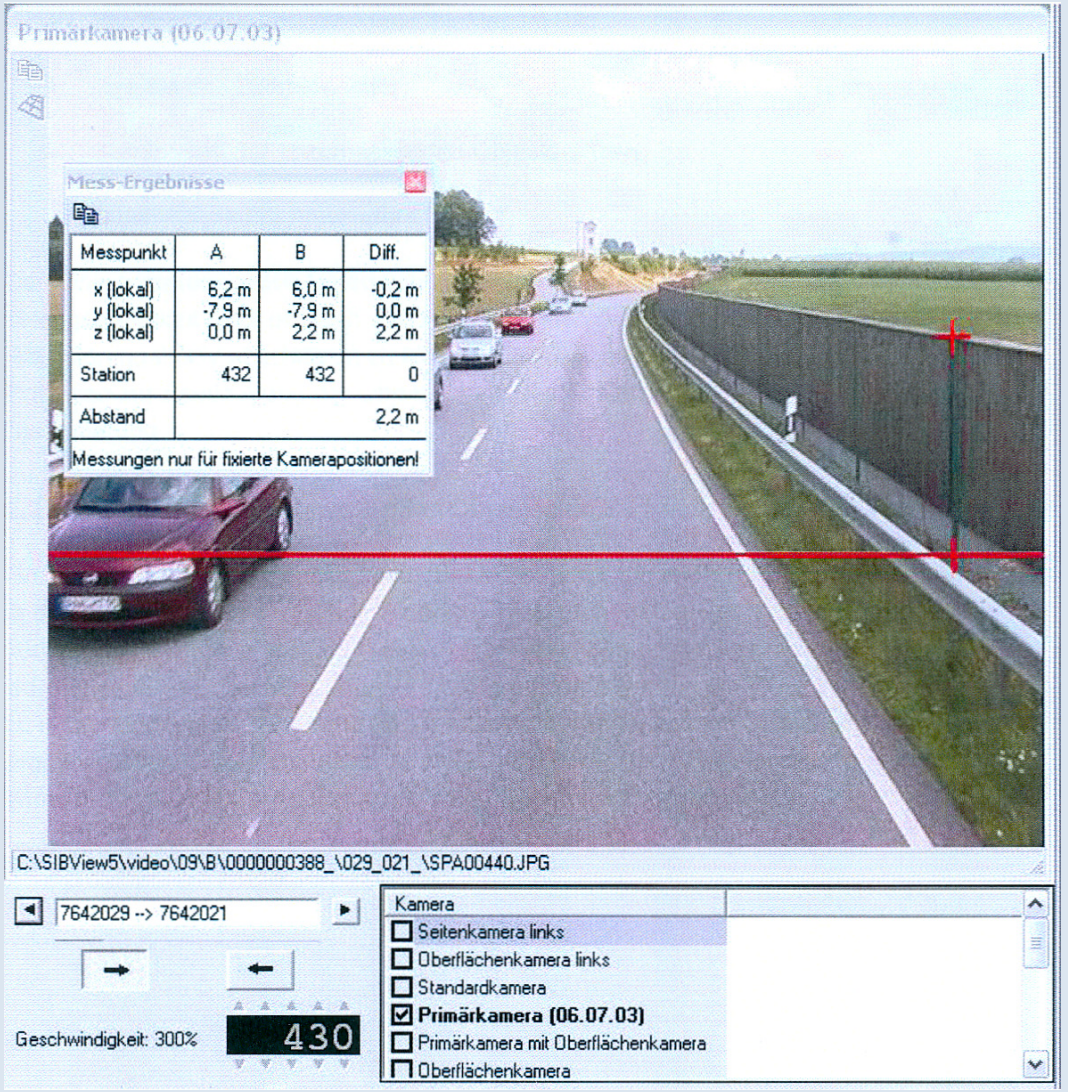
Noise Screens

3 dimensional informations, based on actual photos from visual registration of the condition of the road surface, which has to be done every 3 years.



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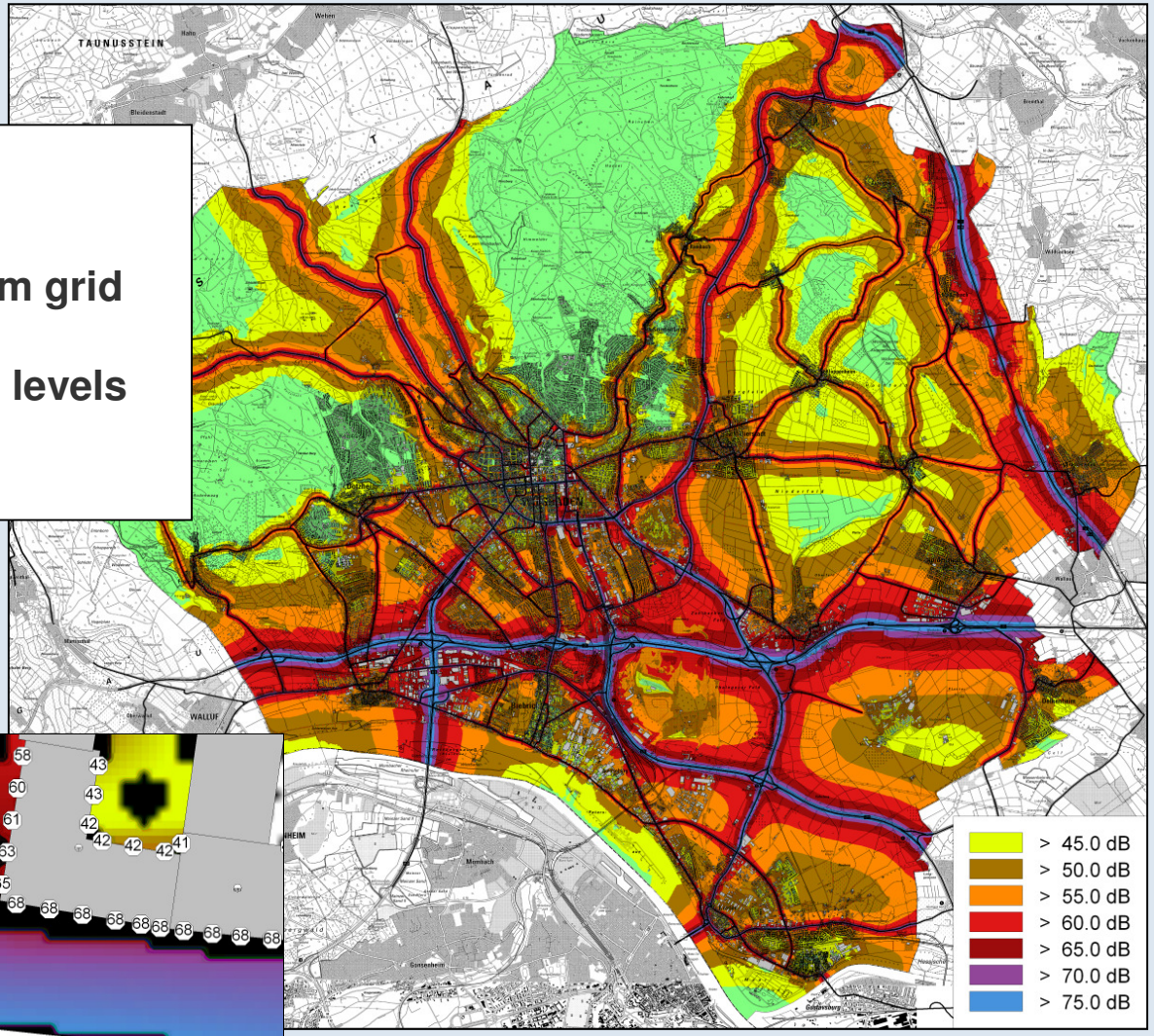
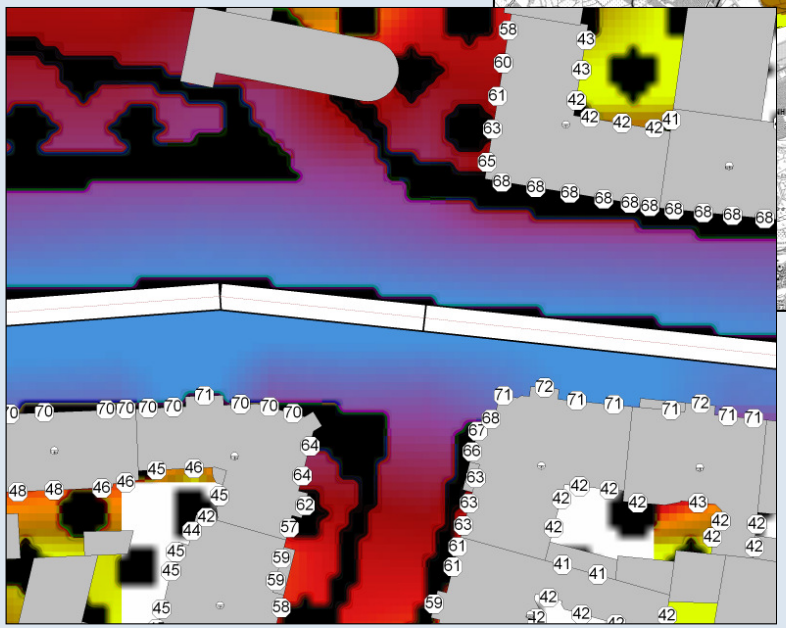
Mapping

Calculation of 10 x 10 m grid

Calculation of fassade levels around all residential buildings





Statistics according 34. BImSchV (national implementation of END)

Number of people annoyed:
Example: classified main roads Hessen > 6 Mio. Kfz/a

dB(A)		Belastete Menschen (nach VBEB) - Straßenlärm	
über	bis	L_{DEN}	L_{Night}
50	55	-	128400
55	60	236700	35000
60	65	65300	13300
65	70	20300	5800
70	75	11000	200
75		4800	0
Summe		**338100**	**182700**

Statistics according 34. BImSchV

Size of affected areas, affected dwelling, schools and hospitals
Example: classified main roads Hessen > 6 Mio. Kfz/a

dB(A) L_{DEN}		Straßenlärm			
über	bis	Fläche (km²)	Wohnungen	Schulgebäude	Krankenhaus-gebäude
55	65	1035.9	143800	118	170
65	75	328.3	14900	17	29
75		101.0	2300	3	4
Summe		**1465.3**	**161000**	**138**	**203**

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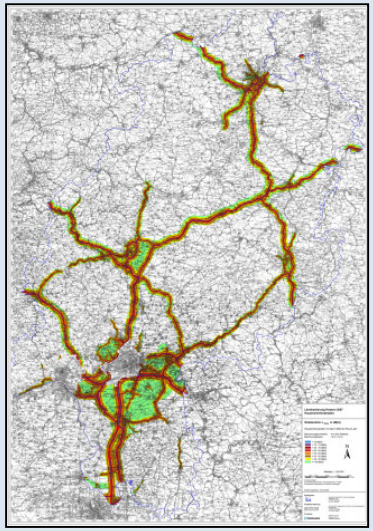
Noise maps and analysis for the following areas and sources

Hessen outside agglomerations:	main roads,
Agglomeration Frankfurt a.M.:	roads, rail (tram and metro (overground), industry, harbours
Agglomeration Wiesbaden:	roads
International Airport Frankfurt:	flight routes and -movements (DES 2005)



Mapping results on Internet:

Hessen:	**www.hlug.de/medien/laerm/umgebungslaerm.htm**
Baden-Württemberg:	**www.lubw.baden-wuerttemberg.de**
Schleswig-Holstein:	**www.umweltdaten.landsh.de/laermatlas**

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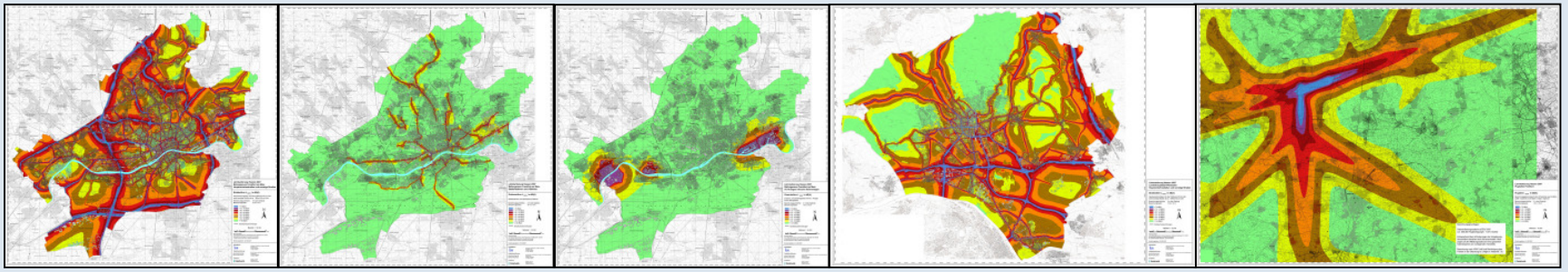

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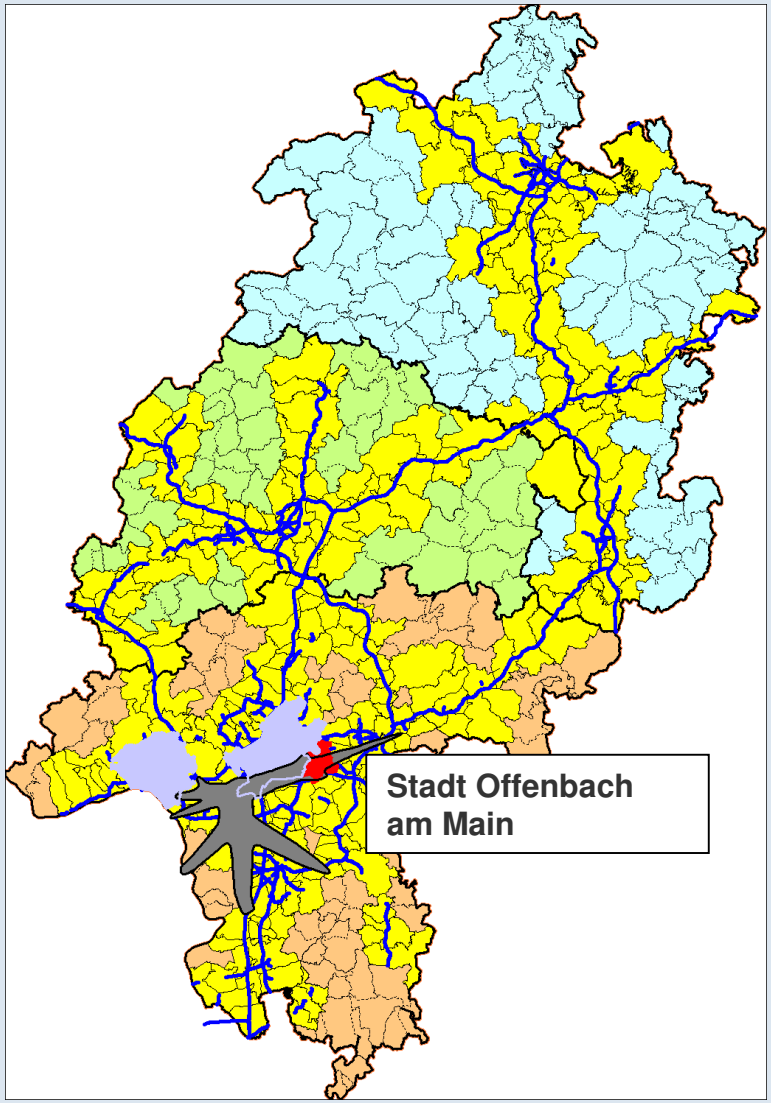
Additional Analysis for Noise Action Planning

Investigation of number people affected per community (statistics)



Example:City Offenbach am Main, road noise

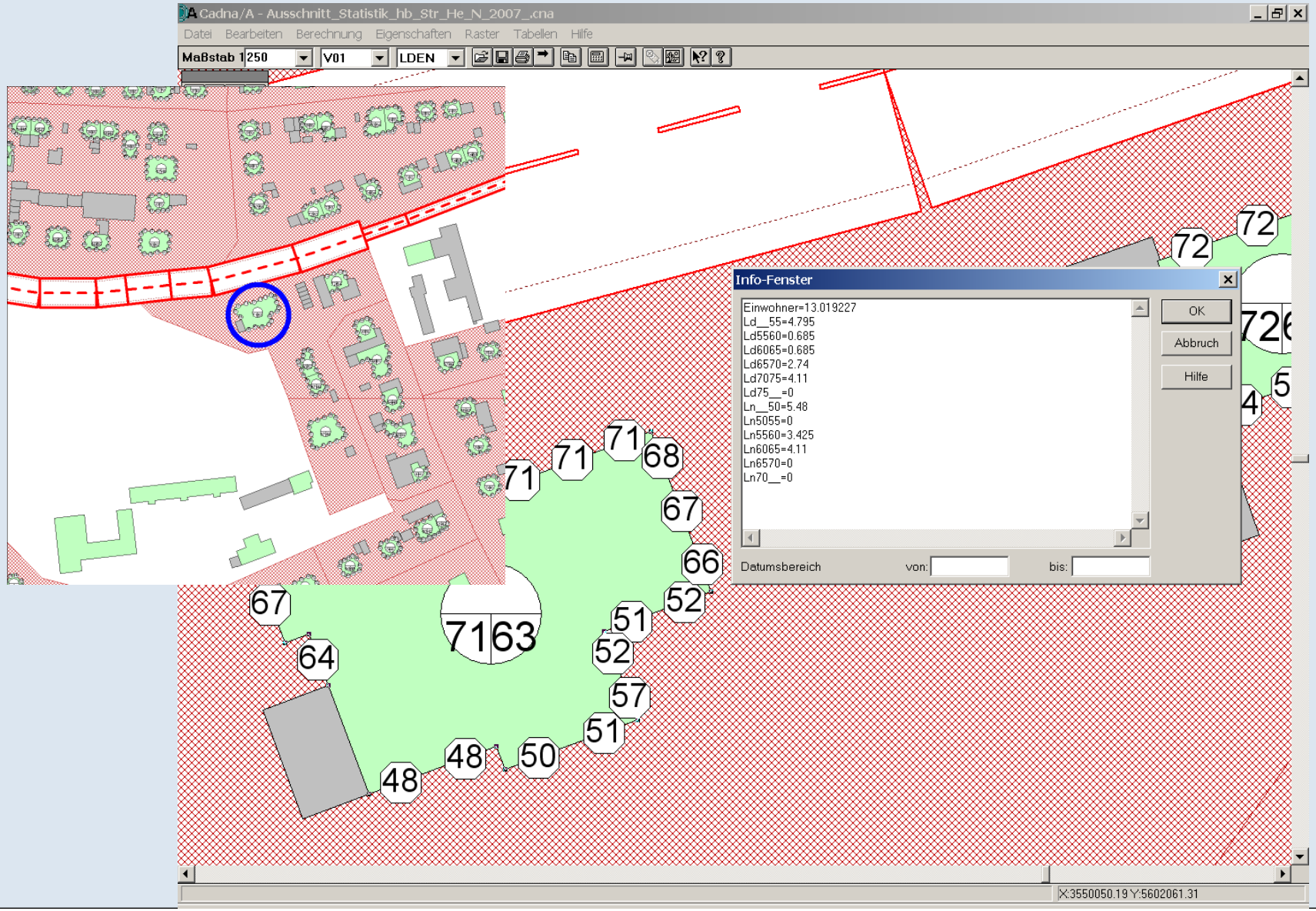
dB(A)		Belastete Menschen (nach VBEB) - Straßenlärm	
über	bis	L_{DEN}	L_{Night}
50	55	-	4190
55	60	9180	1580
60	65	2770	1060
65	70	1220	450
70	75	1050	0
75		340	0
Summe		14560	7280

Example: City Offenbach am Main, aircraft noise

dB(A)		Belastete Menschen (nach VBEB) - Fluglärm	
über	bis	L_{DEN}	L_{Night}
50	55	-	32700
55	60	45660	0
60	65	9800	0
65	70	0	0
70	75	0	0
75		0	0
Summe		55460	32700

Additional Analysis for Noise Action Planning

Investigation of number people affected per building (statistics)



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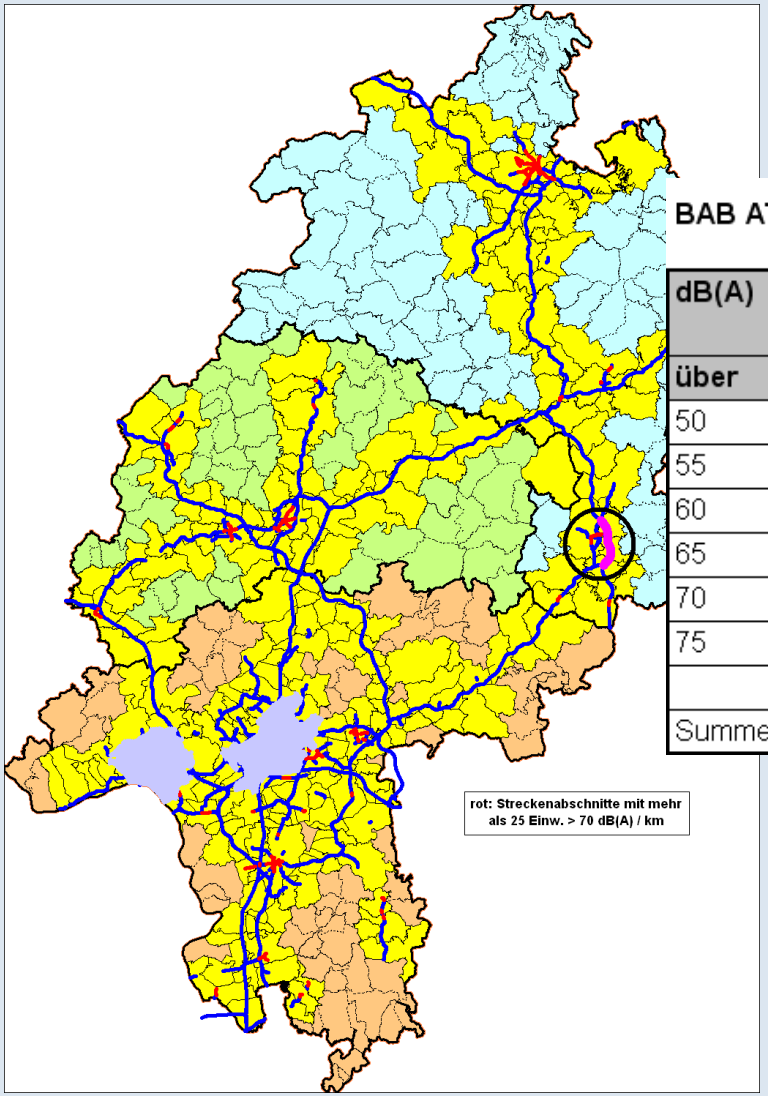
Additional Analysis for Noise Action Planning

Investigation of number people affected per road section (statistics)



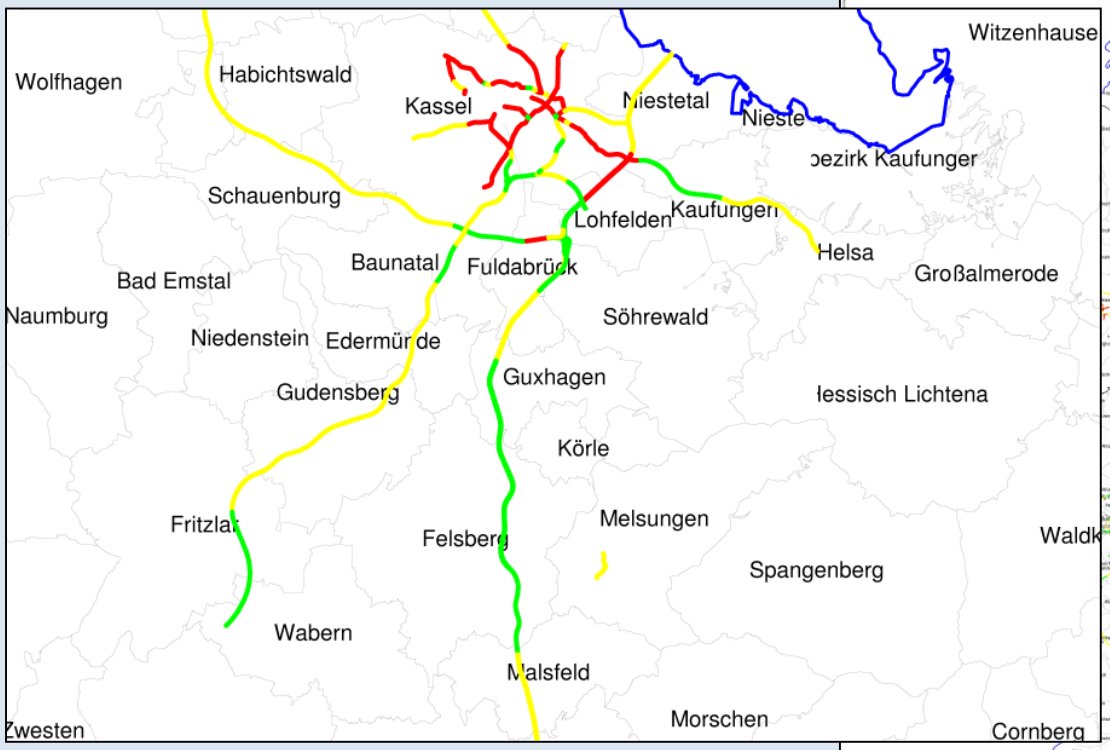
BAB A7 ID: A___7__039 Abschnittslänge 11756 m

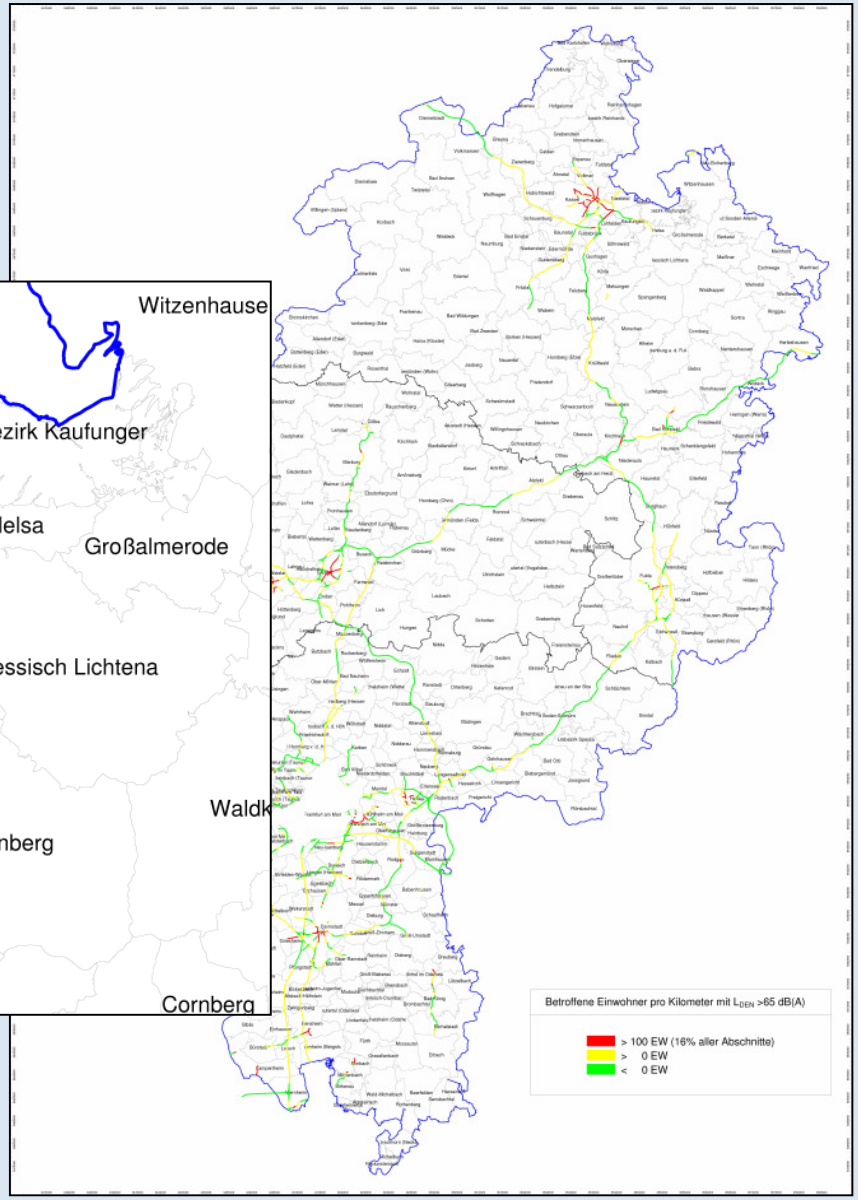
dB(A)		Belastete Menschen (nach VBEB) - Straßenlärm	
über	bis	L_{DEN}	L_{Night}
50	55	-	708
55	60	1194	109
60	65	257	32
65	70	57	4
70	75	6	0
75		1	0
Summe		1514	852

Additional Analysis for Noise Action Planning

Hot Spots along main roads of Hessen

Number inhabitants/km > 65 dB(A)
L_{den}





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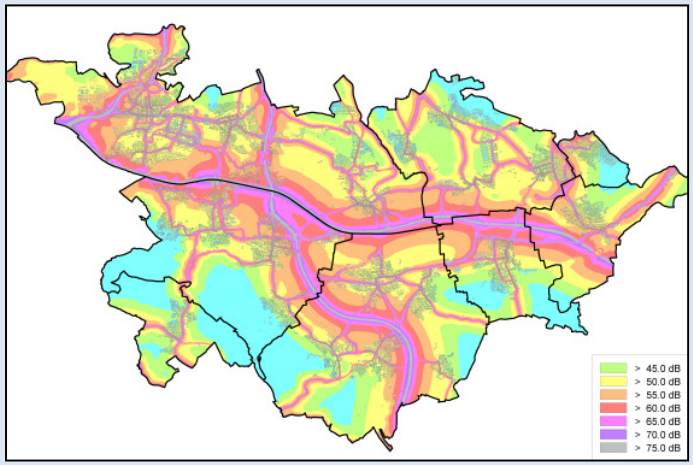
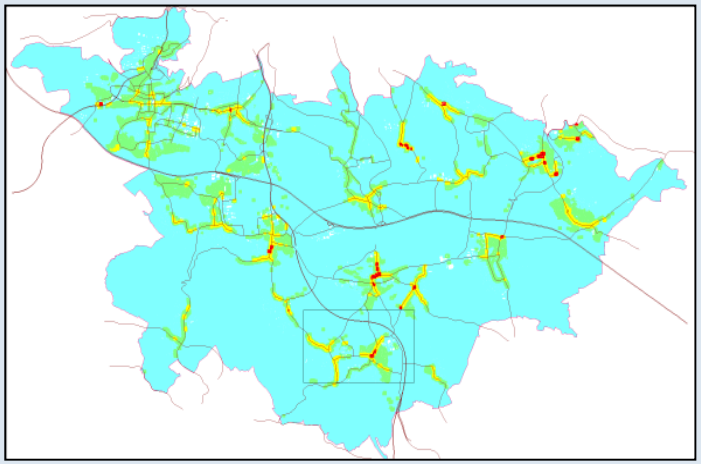
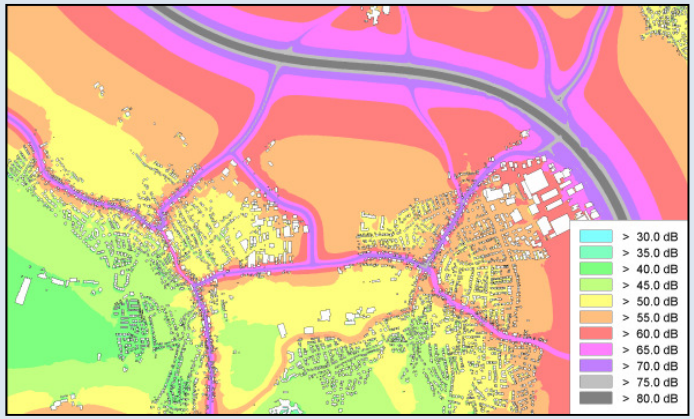
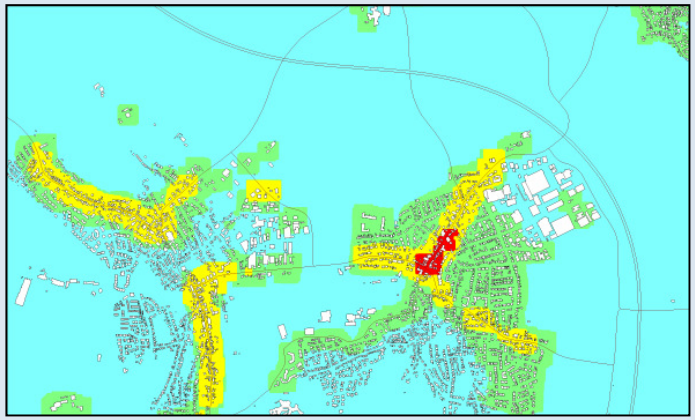
Additional Analysis for Noise Action Planning

Hot Spots along main roads (area near Stuttgart)





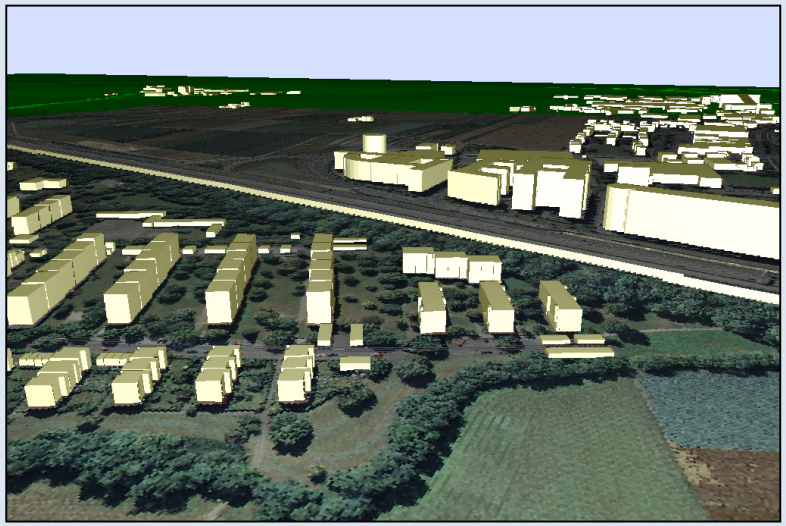


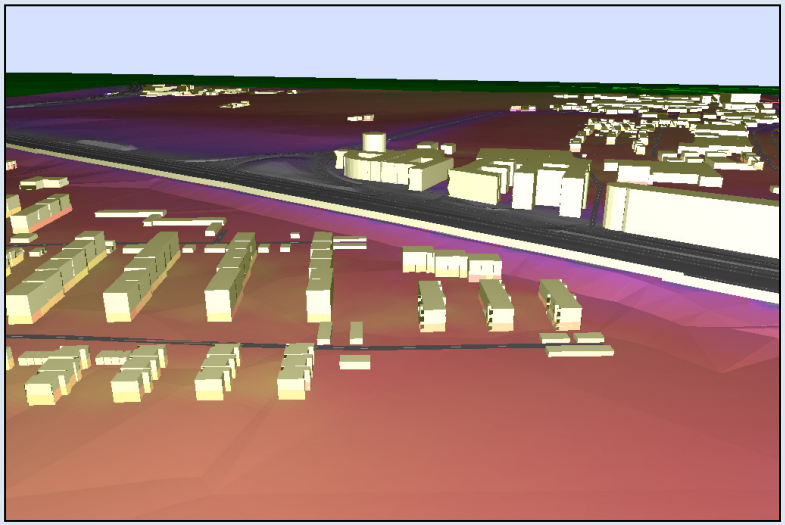


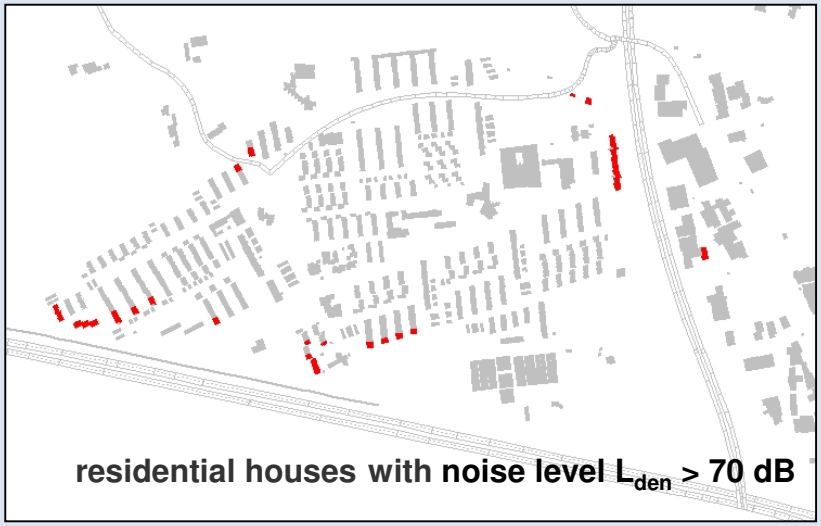
Hot Spot detection using Noise Environmental Rating System

Additional Analysis for Noise Action Planning

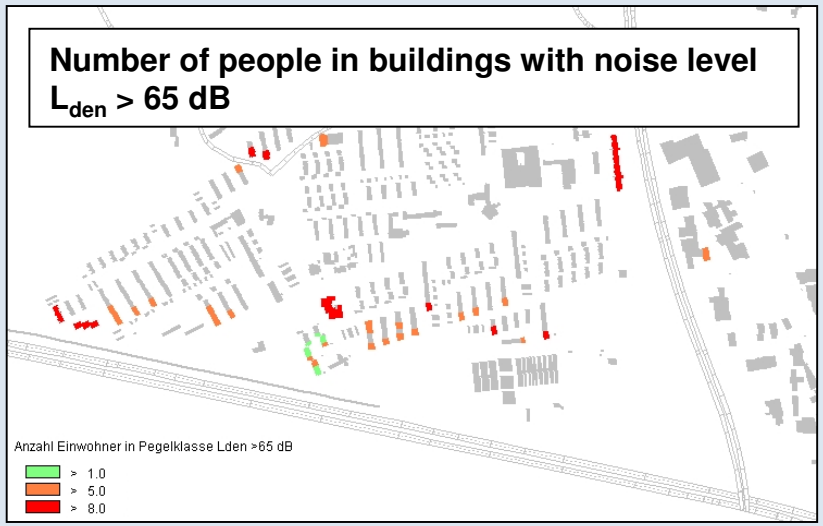
Visualizing residential houses with certain noise levels at fassades

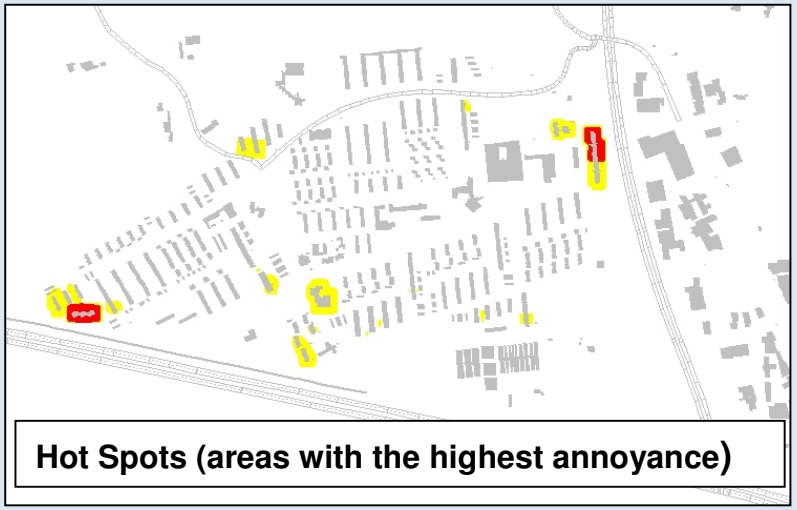






Additional Analysis for Noise Action Planning





Procedure and Contents of an actionplan

Nov. 2007

Dez. 2007

April 2008

15. May 2008

18. July 2008

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Thank you for your attention

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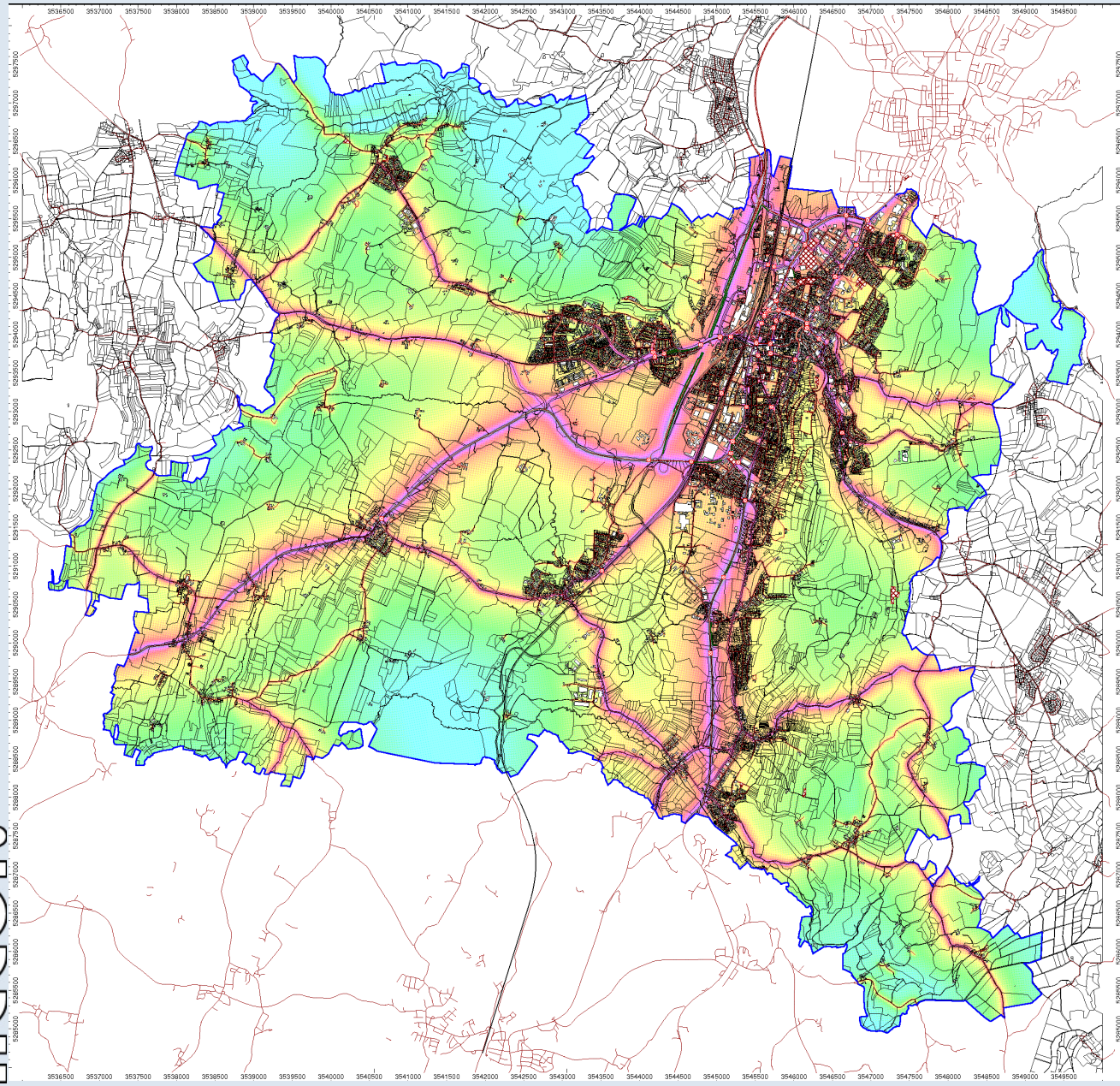

Lärminformationssystem

Stadt Ravensburg

Auftraggeber:
Ministerium für Umwelt
und Verkehr
Baden-Württemberg

Beurteilungspegelkarte

Straßenverkehrslärm
(inkl. Parkplätze)

Beurteilungszeitraum: Tag (6-22 Uhr)

5m über Gelände, 10m x 10m Raster

Pegel in dB(A)

- > 0.0 dB
- > 35.0 dB
- > 40.0 dB
- > 45.0 dB
- > 50.0 dB
- > 55.0 dB
- > 60.0 dB
- > 65.0 dB
- > 70.0 dB
- > 75.0 dB
- > 80.0 dB

- Stadtgrenze
- Punktquelle
- Straße
- Kreuzung
- Parkplatz
- Schiene
- Haus
- Schirm

N

Datum: 23.02.01
Plotdatei: Lr_Strasse_t.prn

Maßstab 1:25000

Programm: Cadna/A Datakustik GmbH

ACCON GmbH
Ingenieurbüro für Schall- und Schwingungstechnik
Gräfelfinger Str. 133A
81375 München
Tel. 089 / 701059
Fax. 089 / 7009602

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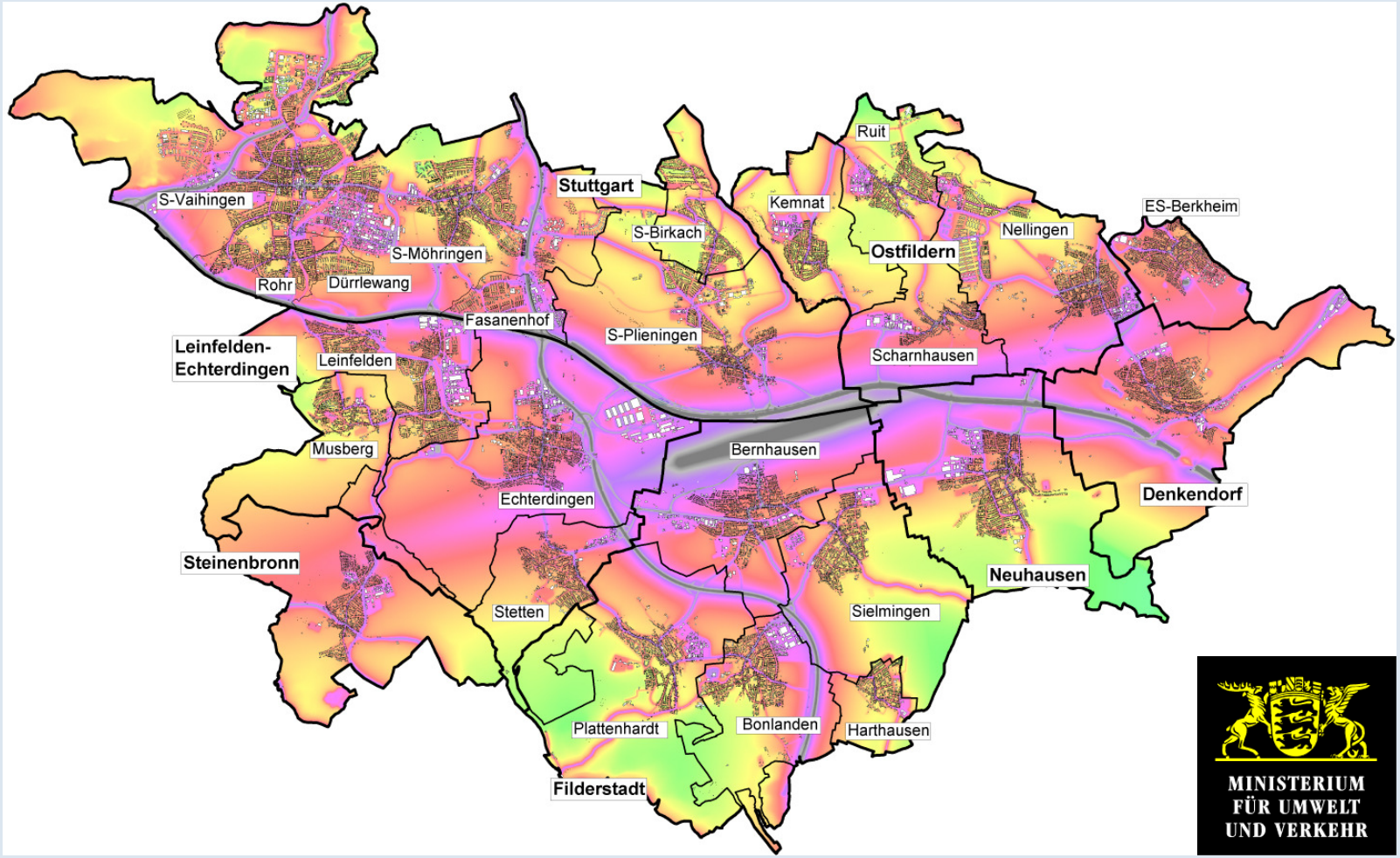
Project Presentation - Action Planning Region Filder



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Project Presentation - Action Planning Region Filder

Regional data

Total size of

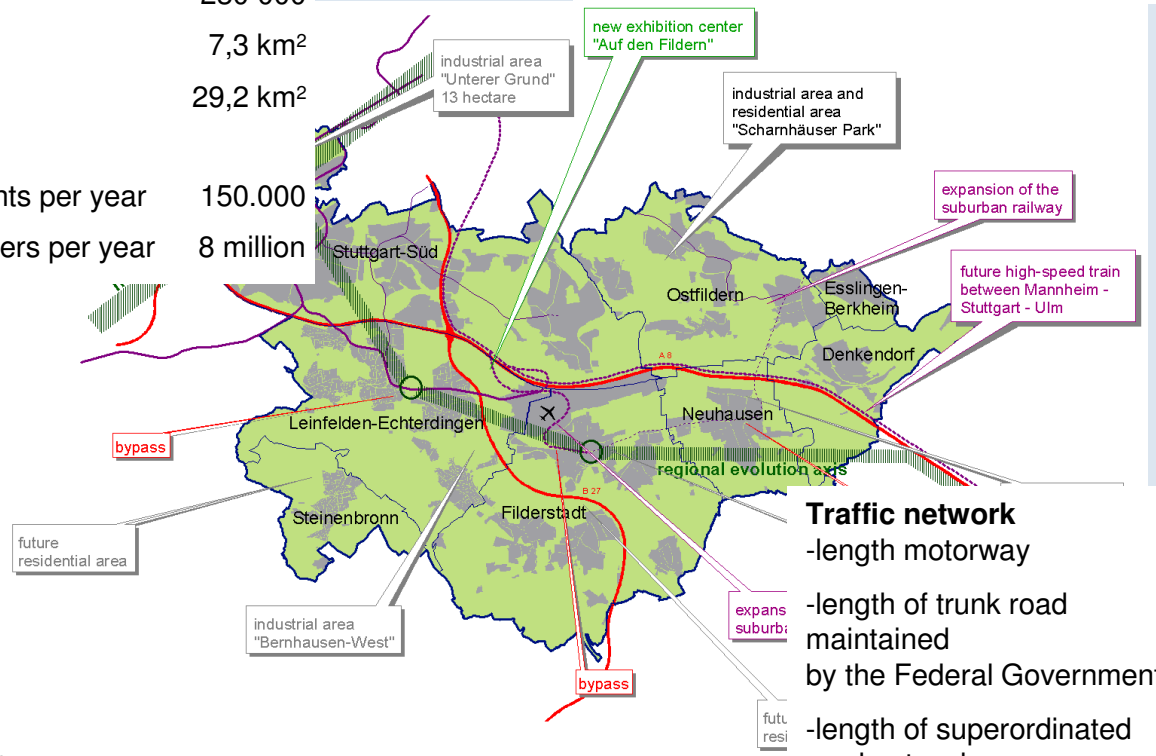
investigating area	188 km²
Inhabitants	230 000
industrial areas	7,3 km²
residential areas	29,2 km²

Airport data

- aircraft movements per year	150.000
- (airline) passengers per year	8 million

Quality of location

- very attractive business location
- area with all in all (still) high quality of living
- high total noise pollution in many areas in the region



Traffic network

-length motorway	32 km
-length of trunk road maintained by the Federal Government	34 km
-length of superordinated road network	213 km
-length of subordinated road network	671 km
-length of rail network	22 km

Evolution intention

- location for nationwide important exhibition centre
- further industrial increase in the region
- increase of traffic and population

Noise Situation in the Investigated Region [by night time]

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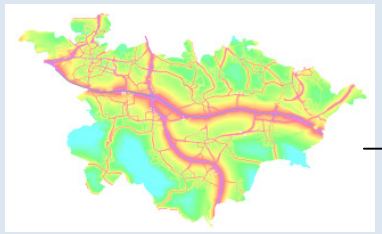
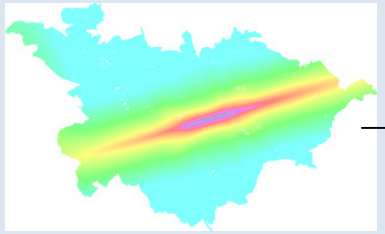
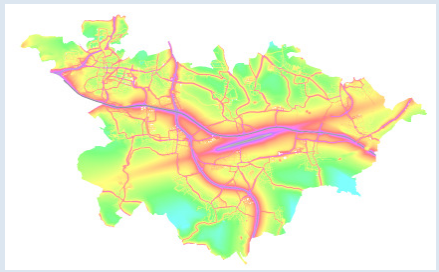
Status Quo

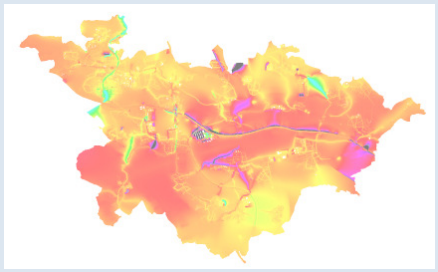

road

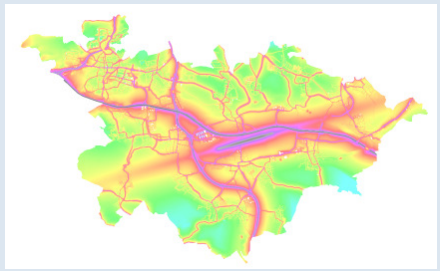
rail


aircraft

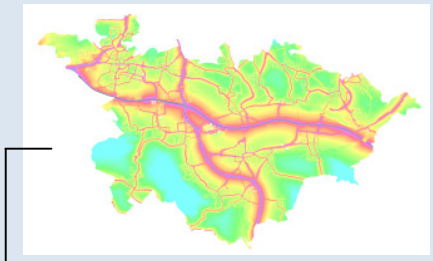
industry, sport / leisure

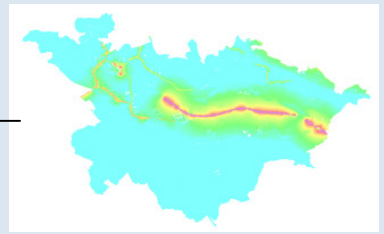

noise situation - status quo

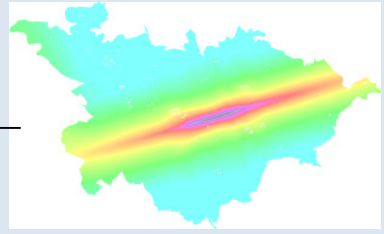

prognosis - status quo

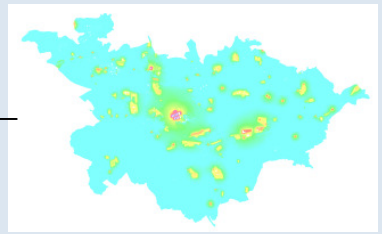

noise situation - prognosis

Prognosis


road

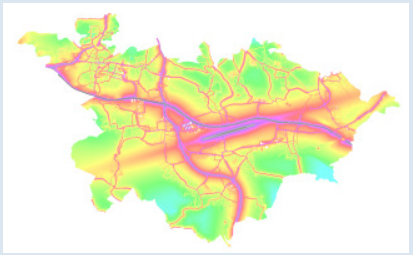

rail


aircraft


industry, sport / leisure

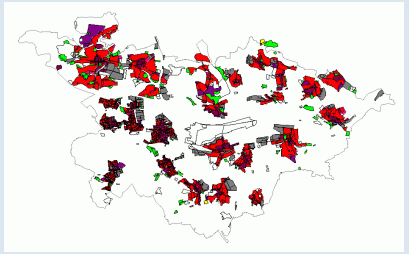
www.noiseRus.com

Conflict Areas in the Investigated Region [by night time]



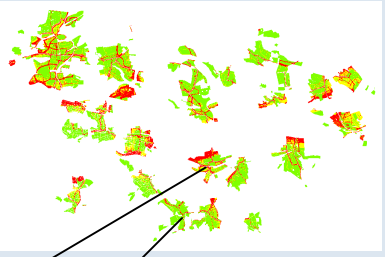
noise situation (in consideration of all sources) – prognosis

-



different noise sensitive areas with corresponding limiting values

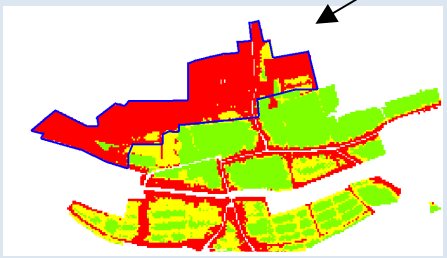
=



conflict map – prognosis

analysis

- conflicts result by total noise load from the sources aircraft, motorway and federal road
- insignificant: local sources



analysis

- main source: communities connecting road and
- basic load caused by aircraft and federal road

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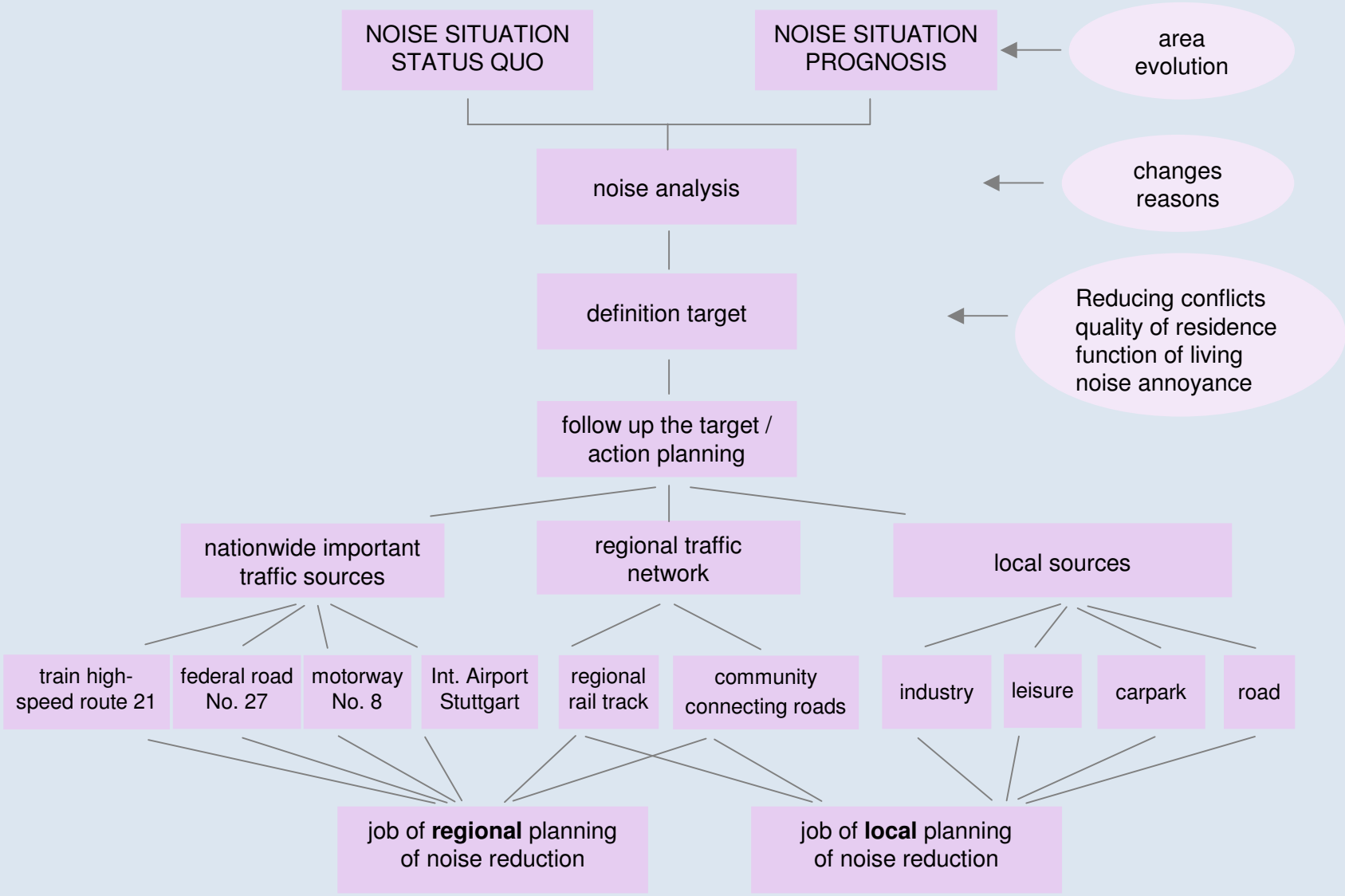
Procedure of Action Planning for the Region of Filder



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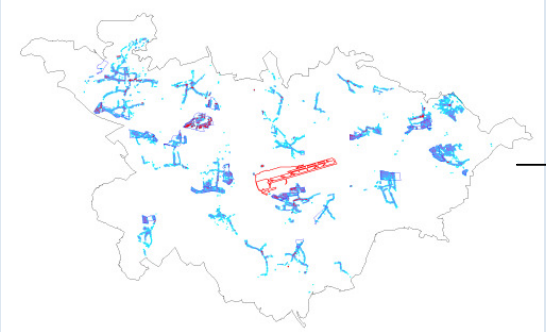
Step by Step Action Planning

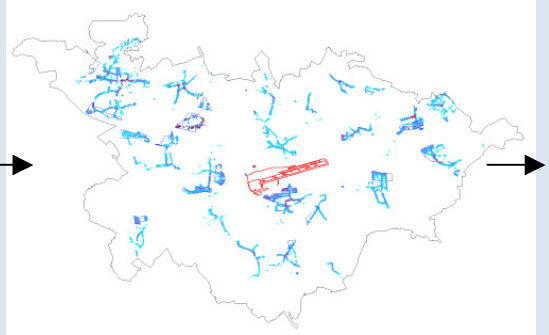


area of conflict, conflict string with high annoyance, prognosis 2010+x

action planning step 1

target: reducing noise from main sources
e.g. fed. road No 27: -3 dB(A);
motorway No 8: -4.5 dB(A);
Int. Airport Stuttgart: -3 dB(A);

Work program: to define actions at round table with ministries, communities and planning engineers by using cost effective analysis

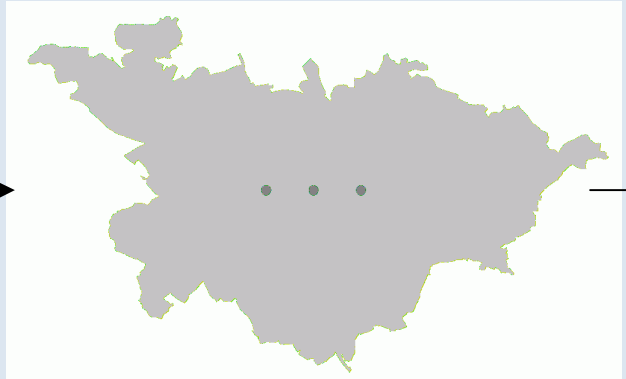


area of conflict, conflict string with high annoyance by realization of the actions in step 1

action planning step 2

target: reducing noise from other regional traffic network
e.g. construction of barriers are here possible, bypasses, ban of night truck driving, truck routing program, city logistic

Work program: to define actions at a round table with ministries, communities and planning engineers by using cost effective analysis



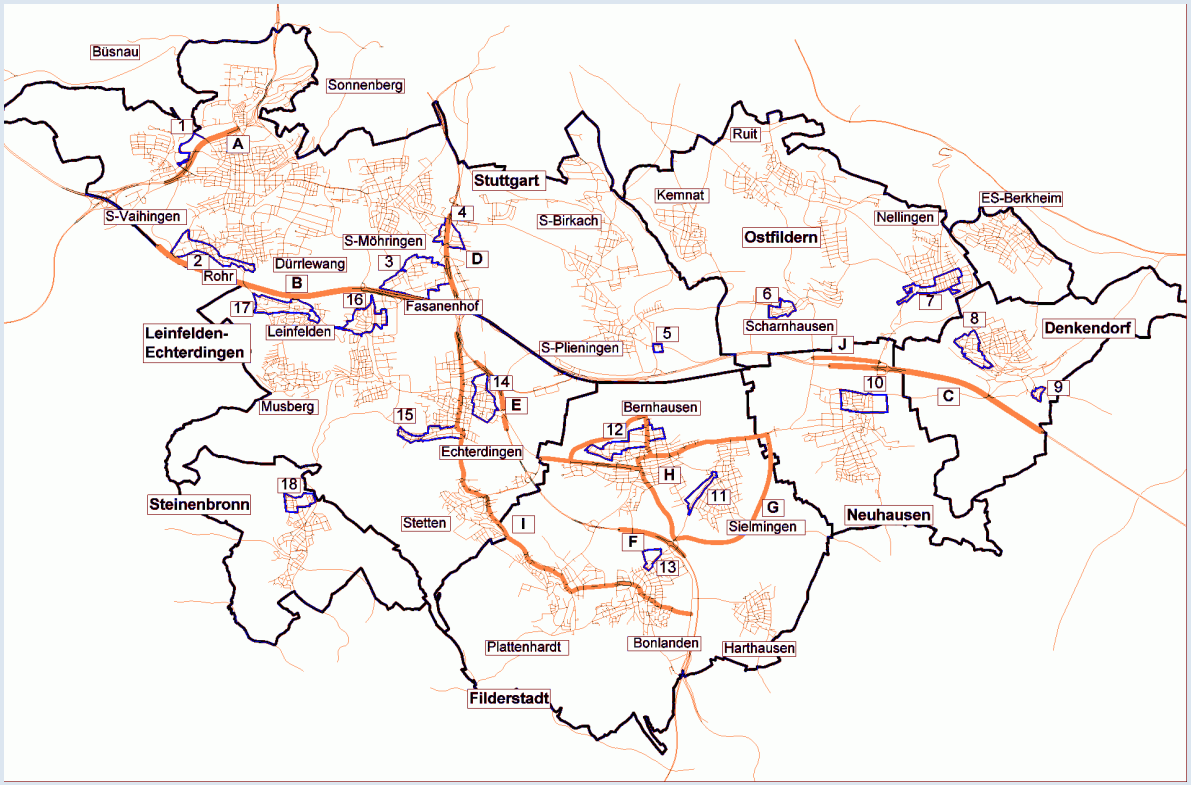
area of conflict, conflict string with high annoyance by realization of the actions in step 2

action planning step 3

target: reducing noise from local sources

Catalogue of measures discussed (incomplete)

- Restricting traffic for trucks (max. weight > 7,5 t)
- By-pass roads
- Quiet road surfaces (-5 dB(A))
- New or larger screens
- Speed restrictions
- Restrictions with licences for new residential areas in highly noisy areas
- Noise protection at buildings



Valuation of Noise Reduction Measures

…by using the singular parameter of the noise annoyance (product of noise level of each building and number of annoyed people in the building). Valuation based on a change /decrease of total noise load (sum of noise annoyance of each building) in a defined area (conflict area / investigated area)

253	effectiveness in conflict area
1114	effectiveness in town district

Location of measure	Inhabitant in relevant conflict areas	Noise reduction tools to reach the defined target	effectiveness (D LEG) based on a reduction of aircraft noise from		costs	effectiveness / costs without reduction of aircraft noise	decrease of total noise load	Corresponding quota of inhabitants with noise reduction of 3 dB(A)
			0	-3 (T/N)	€	[D LEG/ 1000 €]	%	% (abs.)
A	13 + 92813	Quiet road surface (1,5 km Drainasphalt (-5 dB(A)), 0,7 km Splitmastix (-2 dB(A))	253	253	1.075.000	0,24	12 %	62 % (581)
A 831 Stuttgart - Vaihingen			1114	1270				
A alternativ		Larger screen and new screen in the middle of the road (-2 dB(A))	112	126	3.000.000	0,04	5 %	27 % (256)
			470	624				
		Road tunnel (-20 dB(A))	359	364	20.000.000	0,02	16 %	87 % (821)
			1657	1818				
B	13.043	Drainasphalt and speed restriction v_{max} = 100 km/h (total - 4 dB(A))	2705	2926	3.904.000	0,69	10 %	55 % (7.214)
A 8 Rohr / Fasanenhof / LE			4030	5241				
B alternativ		Larger screen and new screen in the middle of the road (-2 dB(A))	1516	1699	12.000.000	0,13	6 %	31 % (4.044)

13 prognosis (planned real estate area)

Costs of “First aid” program

Estimated for the years 2003 - 2008

Total costs	**~ 23 million €**
Rates	
airport	3.0 million €
land	7.5 million €
citizens	10.0 million €
communities	2.5 million €

“First aid” program

“with a 23 million Euro fond”

Development of a Concept for Low Noise Routing for Heavy Traffic in the Road Net of the Region of Stuttgart

Build up new or larger screens and walls along the motorway A 8, especially closing the „wholes“, caused by bridges, in the realized walls

Implementation of noise protection (windows, ventilators) at 4000 buildings on roads and under flight tracks in the investigated area

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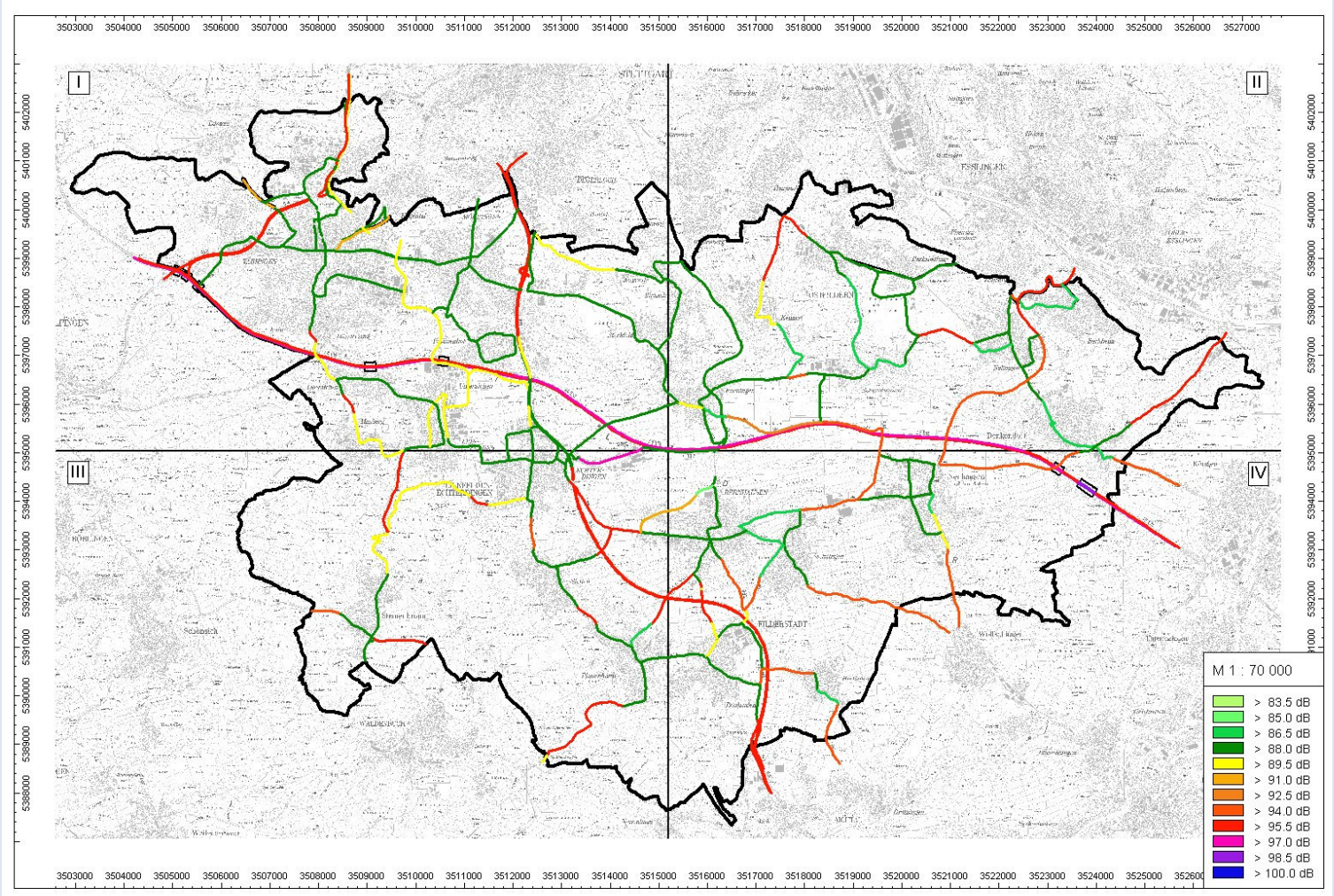
Development of a Concept for Low Noise Routing for Heavy Traffic in the Road Net of the Region of Stuttgart



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Noise Reduction of the Screens on the Viaducts in Denkendorf

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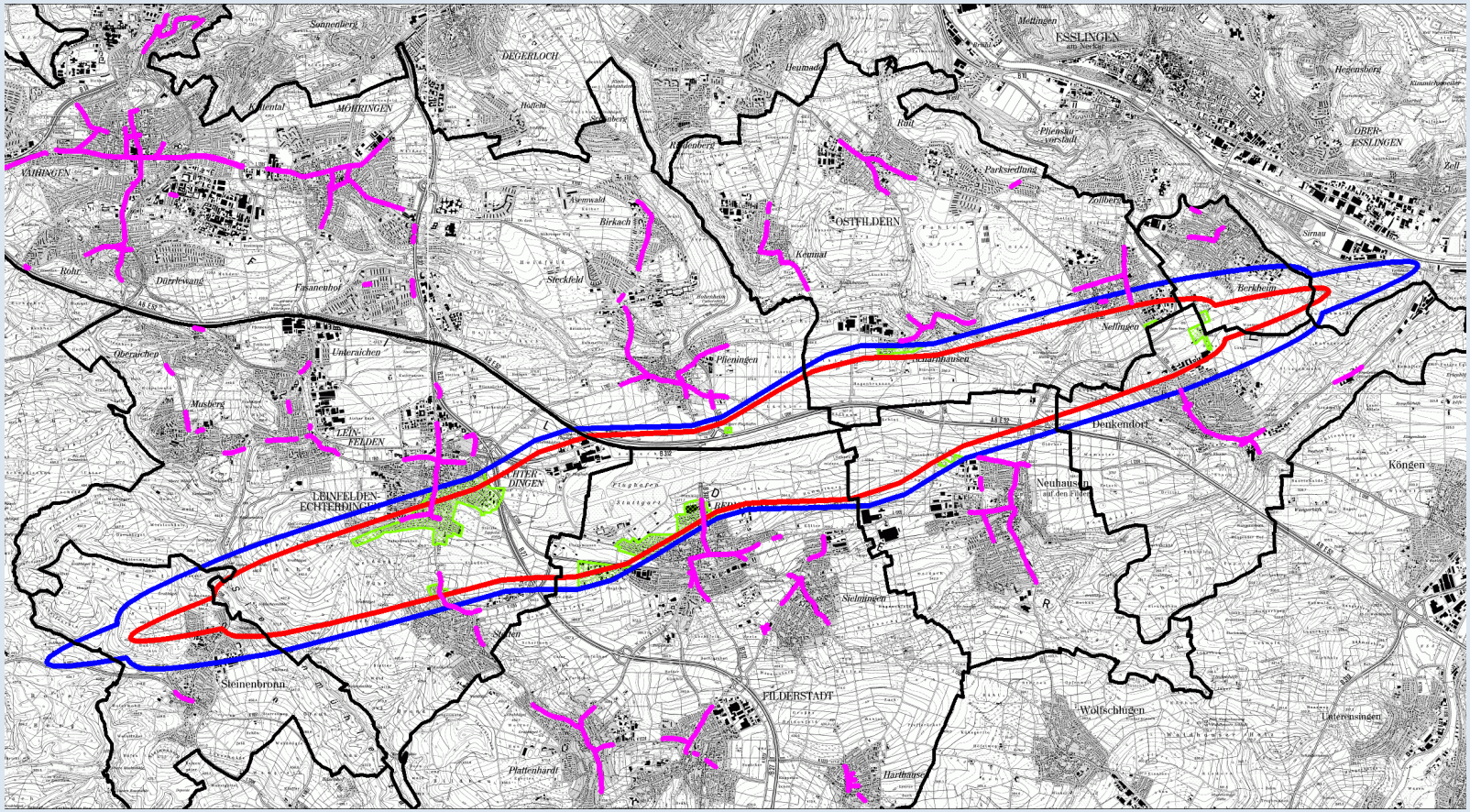
Implementation of noise protection (windows, ventilators) at 4000 buildings on roads and under flight tracks in the investigated area



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