



Community Response to Multiple Sound Sources: Integrating Acoustic and Contextual Approaches in the Analysis

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Supplementary Material

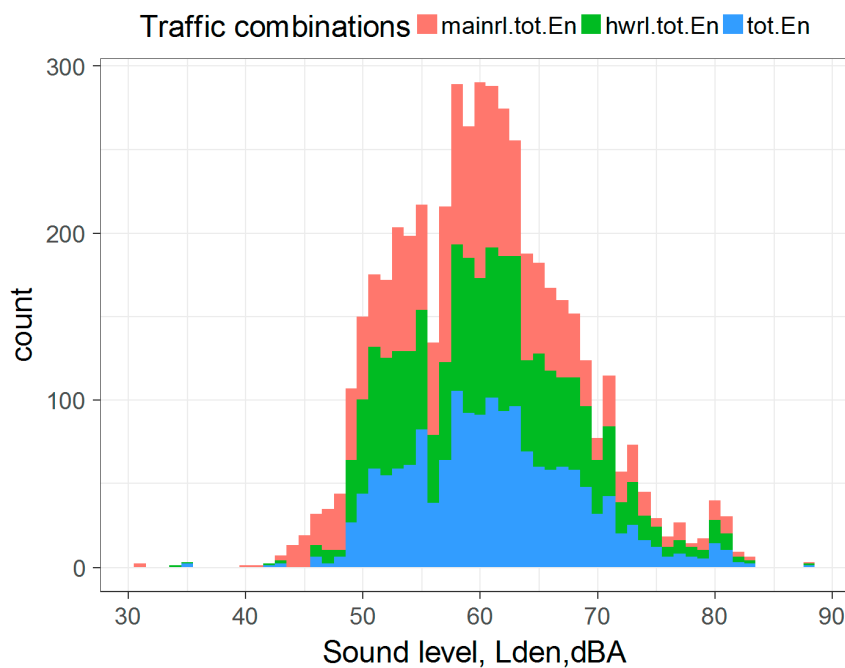
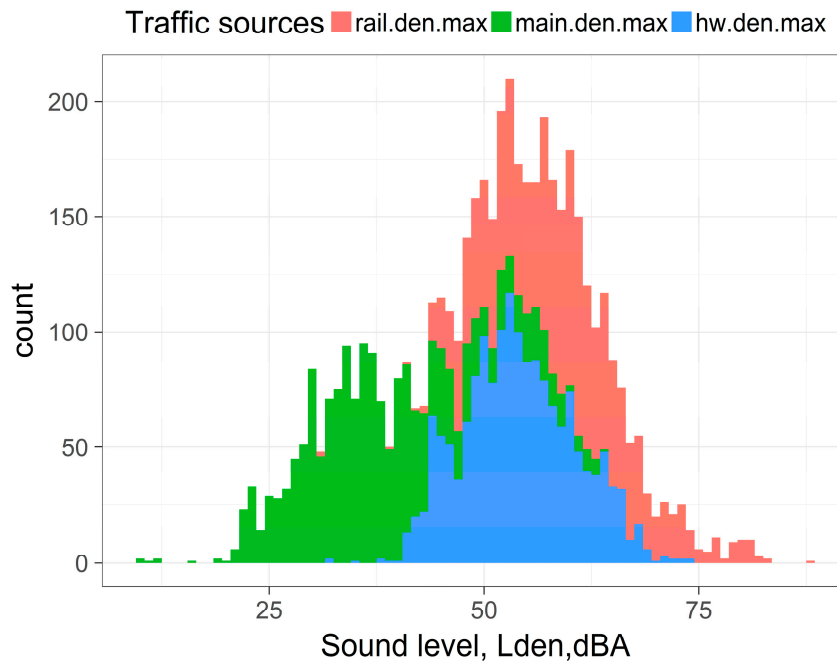


Figure S1. (a) Single source sound level distribution and the number affected in the ALPNAP-sample. (rail.den.max=railway level; main.den.max=main road level; hw.den.max=highway level). **(b)** Multiple source sound level distribution and the number affected in the ALPNAP-sample. (mainrl.tot.En=main road-railway combination; hwrl.tot.En=highway-railway combination; tot.En=mainroad-highway-railway combination).

Below are the Anova tables of selected models to illustrate the differences among the various models expressed in numbers for the interested reader.

Table S1. High annoyance model with all single sources, no adjustments (**crude model**).

Predictor	Wald chi-square	df	P-value
Main road, Lden	36.37	2	<.0001
Nonlinear	6.37	1	0.0116
Railway, Lden	16.79	2	0.0002
Nonlinear	2.91	1	0.0878
Highway, Lden	11.03	2	0.0040
Nonlinear	0.17	1	0.6824
TOTAL NONLINEAR	13.49	3	0.0037
TOTAL	91.79	6	<.0001
R ² = 0.085		corresponding with Figure 1a	

Table S2. High annoyance model with all single sources, five adjustments (**base model**).

Predictor	Wald chi-square	df	P-value
Main road, Lden	31.03	2	<.0001
Nonlinear	5.31	1	0.0212
Railway, Lden	15.04	2	0.0005
Nonlinear	2.38	1	0.1227
Highway, Lden	12.90	2	0.0016
Nonlinear	0.45	1	0.5025
Age (yrs)	0.79	1	0.3728
Sex	0.06	1	0.8037
Education (3 levels)	9.65	2	0.0080
Noise sensitivity (2 levels)	35.65	1	<.0001
Health status (3 levels)	19.06	2	0.0001
TOTAL NONLINEAR	12.16	3	0.0069
TOTAL	146.04	13	<.0001
R ² = 0.145		corresponding with Figure 4a	

Table S3. High annoyance model with all single sources, full adjustments (**contextual model**).

Predictor	Wald chi-square	df	p-value
Main road, Lden	7.65	2	0.0218
Nonlinear	2.50	1	0.1141
Railway, Lden	2.50	2	0.2872
Nonlinear	2.28	1	0.1307
Highway, Lden	2.02	2	0.3637
Nonlinear	1.25	1	0.2641
Age (yrs)	0.19	1	0.6642
Education (3 levels)	3.95	2	0.1386
Health status (3 levels)	2.58	2	0.2757
Complaints about soundscape (4 levels)	22.07	1	<.0001
Complaints about air pollution (4 levels)	5.00	1	0.0253
Dust/soot (high vs low perception)	25.14	1	<.0001
Anger at traffic load (4 levels)	25.00	2	<.0001
Sum of coping	42.26	1	<.0001
Vibration (3 levels of percpetion strength)	6.73	2	0.0346
TOTAL NONLINEAR	4.97	3	0.1739

TOTAL	380.98	19	<.0001
R ² = 0.55	corresponding with Figure 17a		

Table S4. Linear regression: Mean annoyance model with all single sources, 5 adjustments (**base model**).

Predictor	df	Partial SS	MS	F	P-value
Main road, Lden	2	47.5698820	23.7849410	16.56	<.0001
Nonlinear	1	6.1654770	6.1654770	4.29	0.0384
Railway, Lden	2	34.2210170	17.1105090	11.91	<.0001
Nonlinear	1	2.5818480	2.5818480	1.80	0.1802
Highway, Lden	2	24.1817950	12.0908970	8.42	0.0002
Nonlinear	1	5.7555950	5.7555950	4.01	0.0455
Age (yrs)	1	4.2364300	4.2364300	2.95	0.0861
Sex	1	3.3540760	3.3540760	2.34	0.1267
Education (3 levels)	2	20.2811820	10.1405910	7.06	0.0009
Noise sensitivity (2 levels)	1	51.5983800	51.5983800	35.93	<.0001
Health status (3 levels)	2	47.8697220	23.9348610	16.67	<.0001
TOTAL NONLINEAR	3	25.7604320	8.5868110	5.98	0.0005
REGRESSION	13	341.3753750	26.2596440	18.28	<.0001
ERROR	1627	2336.7087200	1.4362070		
R ² = 0.127	Figure not shown in the paper				

Table S5. Linear regression: Mean annoyance model with mixed sources, full adjustments (**contextual model**): Highway-railway combination.

Predictor	df	Partial SS	MS	F	P-value
Highway-railway combination, Lden	2	3.89057738	1.94528869	2.84	0.0589
Nonlinear	1	0.07748352	0.07748352	0.11	0.7368
Age (yrs)	1	1.20767088	1.20767088	1.76	0.1846
Education (3 levels)	3	2.10322796	0.70107599	1.02	0.3816
Current health status (3 levels)	1	0.43386264	0.43386264	0.63	0.4264
Complaints about soundscape (4 levels)	2	3.46531096	1.73265548	2.53	0.0802
Complaints about air pollution (4 levels)	1	84.28729251	84.28729251	122.95	<.0001
Dust/soot (high vs low perception)	1	2.30552534	2.30552534	3.36	0.0669
Anger at traffic load (4 levels)	1	32.95392214	32.95392214	48.07	<.0001
Sum of coping	2	42.95513104	21.47756552	31.33	<.0001
Vibration (3 levels of percpetion strength)	1	72.38118332	72.38118332	105.58	<.0001
vibra.f3	2	15.90078692	7.95039346	11.60	<.0001
REGRESSION	17	1565.42789904	92.08399406	134.32	<.0001
ERROR	1623	1112.65619602	0.68555527		
R ² =0.585	corresponding with Figure 15a				

Table S6. Linear regression: Mean annoyance model with mixed sources, full adjustments (**contextual model**): Main road-railway combination.

Predictor	df	Partial SS	MS	F	P-value
Main road-railway combi	2	5.8118749	2.9059375	4.25	0.0145
Nonlinear	1	0.4317622	0.4317622	0.63	0.4271
Age (yrs)	1	1.1421510	1.1421510	1.67	0.1966
Education (3 levels)	3	2.1001728	0.7000576	1.02	0.3814
Noise sensitivity (2 levels)	1	0.4362432	0.4362432	0.64	0.4248
Health status (3 levels)	2	3.5949591	1.7974795	2.63	0.0726
Complaints about soundscape (4 levels)	1	82.7782681	82.7782681	120.96	<.0001
Complaints about air pollution (4 levels)	1	2.6338978	2.6338978	3.85	0.0500
Dust/soot (high vs low perception)	1	32.6811489	32.6811489	47.75	<.0001
Anger at traffic load (4 levels)	2	43.1152602	21.5576301	31.50	<.0001
Sum of coping	1	71.9844539	71.9844539	105.18	<.0001
Vibration (3 levels of percpetion)	2	14.7862237	7.3931118	10.80	<.0001

REGRESSION	17	1567.3491966	92.1970116	134.72	<.0001
ERROR	1623	1110.7348985	0.6843715		
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R ² =0.585	corresponding with Figure 15a				

Table S7. Linear regression: Mean annoyance model with mixed sources, full adjustments (**contextual model**): Three source combination (main road, highway, and railway).

Predictor	df	Partial SS	MS	F	P-value
Three source combination	2	4.6398719	2.3199360	3.39	0.0341
Nonlinear	1	0.2187568	0.2187568	0.32	0.5721
Age (yrs)	1	1.2082340	1.2082340	1.76	0.1844
Education (3 levels)	3	2.1158149	0.7052716	1.03	0.3785
Noise sensitivity (2 levels)	1	0.4164399	0.4164399	0.61	0.4357
Health status (3 levels)	2	3.4949605	1.7474802	2.55	0.0783
Complaints about soundscape (4 levels)	1	82.4294748	82.4294748	120.32	<.0001
Complaints about air pollution (4 levels)	1	2.4549832	2.4549832	3.58	0.0585
Dust/soot (high vs low perception)	1	32.6868603	32.6868603	47.71	<.0001
Anger at traffic load (4 levels)	2	43.1575022	21.5787511	31.50	<.0001
Sum of coping	1	71.9847253	71.9847253	105.07	<.0001
Vibration (3 levels of percpetion)	2	15.4682053	7.7341027	11.29	<.0001
<hr/>					
REGRESSION	17	1566.1771936	92.1280702	134.48	<.0001
ERROR	1623	1111.9069015	0.6850936		
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R ² =0.585	corresponding with Figure 15a				

Table S8. Logistic regression: High annoyance model with emergence indicators for all sources, full adjustments (**contextual model**).

Predictor	Wald chi-square	df	P-value
Emergence indicator highway*	5.68	1	0.0171
Emergence indicator main road*	9.28	1	0.0023
Emergence indicator railway*	2.76	1	0.0967
Age (yrs)	0.60	1	0.4372
Education (3 levels)	4.77	2	0.0922
Health status (3 levels)	2.81	2	0.2453
haustyp.3	3.35	2	0.1869
Complaints about soundscape (4 levels)	21.45	1	<.0001
Complaints about air pollution (4 levels)	4.57	1	0.0325
Dust/soot (high vs low perception)	24.45	1	<.0001
Anger at traffic load (4 levels)	25.08	2	<.0001
Sum of coping	41.88	1	<.0001
Vibration (3 levels of perception strength)	7.37	2	0.0251
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TOTAL	381.69	18	<.0001
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R ² = 0.552	corresponding with Figure 20 a,c,d		

* See methods section for definition: 2.2. Sound Exposure Assessment

Annoyance questionnaire

ICBEN questionnaire on annoyance

How annoyed/disturbed were you during the past 12 months in your home and your immediate surrounding (Garden etc.) BY

Not at all annoyed/disturbed 0—1—2—3—4—5—6—7—8—9—10 Extremely annoyed/disturbed

38. durch den Lärm INSGESAMT by noise overall	0	1	2	3	4	5	6	7	8	9	10
	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
39. durch die Luftverschmutzung INSGESAMT by air pollution overall	0	1	2	3	4	5	6	7	8	9	10
	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
40. durch Lärm von der Autobahn by noise from highway	0	1	2	3	4	5	6	7	8	9	10
	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
41. durch Lärm vom Lokalverkehr by noise from local roads	0	1	2	3	4	5	6	7	8	9	10
	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
42. durch Lärm vom Schienenverkehr by noise from railways (underground/tramways)	0	1	2	3	4	5	6	7	8	9	10
	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
43. durch Erschütterungen vom Schienenverkehr by vibration from railways (underground/tramways)	0	1	2	3	4	5	6	7	8	9	10
	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
44. durch Abgase vom Straßenverkehr by traffic exhaust from road traffic	0	1	2	3	4	5	6	7	8	9	10
	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
45. durch Staub, Russ vom Straßenverkehr by soot/dust from road traffic	0	1	2	3	4	5	6	7	8	9	10
	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
46. durch Fluglärm by noise from aircraft	0	1	2	3	4	5	6	7	8	9	10
	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
47. durch Nachbarschaftslärm by noise from neighbours	0	1	2	3	4	5	6	7	8	9	10
	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
48. durch Betriebslärm by noise from businesses/industrial facilities	0	1	2	3	4	5	6	7	8	9	10
	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
49. durch Baulärm by noise from construction	0	1	2	3	4	5	6	7	8	9	10
	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
50. durch Lärm von Freizeiteinrichtungen (Sportplätze, etc.) by noise from sports and leisure facilities	0	1	2	3	4	5	6	7	8	9	10
	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
51. durch Luftverschmutzung durch Betriebe, Industrie by air pollution from businesses/industrial facilities	0	1	2	3	4	5	6	7	8	9	10
	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
52. durch Erschütterungen durch Betriebe, Industrie by vibrations from businesses/industrial facilities	0	1	2	3	4	5	6	7	8	9	10
	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Source: BBT & ALPNAP-studies, Medical University of Innsbruck

SLEEP SCALE

During the past three months did you experience the following sleep problems?

	Never	Rarely	Several times/months	Several times/week	Almost daily
Problems falling asleep	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Wakening up often	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Problems falling back to sleep	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Too early awakening	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Tiredness/fatigue in the morning	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Source: BBT & ALPNAP-studies, Medical University of Innsbruck

EUROBAROMETER SCALE: Noise & air pollution

Q.5. Where you live, do you have very much reason, quite a lot of reason, not very much reason or no reason at all to complain about... ? (SHOW CARD WITH SCALE)

READ OUT	Very much reason	Quite a lot of reason	Not very much reason	No reason at all	DK
1. the quality of tap water (M)	29 1	2	3	4	5
2. the quality of water for swimming (N)	30 1	2	3	4	5
3. noise	31 1	2	3	4	5
4. air pollution	32 1	2	3	4	5
5. waste disposal	33 1	2	3	4	5
6. lack of green spaces	34 1	2	3	4	5
7. damage done to the landscape	35 1	2	3	4	5
8. traffic problems (M)	36 1	2	3	4	5
9. the quality of food products (N)	37 1	2	3	4	5
10. the organisation of civil defence in the face of natural or technological disasters (floods, earthquakes, fires, etc.) (N)	38 1	2	3	4	5

Source: EUROBAROMETER 51.1 APRIL-MAY 1999, CODEBOOK, INRA (EUROPE)