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BORIS MIHAYLOV[1]

[1]SPECTRI LTD,
Bulgarian Association for Public Noise control and Management
Bulgaria

[1]*bmihaylov@nonoise-bg.com*

STRATEGIC NOISE MAPPING AND ACTION PLANNING. EXPERIENCE, PRACTICAL CONCLUSIONS

Abstract: *Based on EU Noise Directive (END - Directive 2002/49/EC) since 2005 started an intensive noise mapping process in EU member states. Some of the countries had a significant tradition in creating noise maps in the past. The END set a new path, and aimed a harmonized global strategic approach to reduce the increasing environmental noise from major sources (causing heavy health impact to EU population).The author has a broad experience in last more than 5 years - creating noise maps and strategic noise plans, mainly in Bulgaria. In the recent paper is presented a short overview of obtained experience and related practical conclusions. The final aim is to determine exact dedicated action plans - based on the strategic noise management (restriction and reduction of the environmental noise impact), and applying set of measures and acoustical planning in short, middle and long terms.*

Key words: strategic noise map(s), action plan(s), environmental noise.

INTRODUCTION

The END defines EU Member States obligations towards overall strategic approach on Environmental Noise Protection.

The aim of END is **"to define a common approach intended to avoid, prevent or reduce on a prioritized basis the harmful effects, including annoyance, due to exposure to environmental noise".**

One can quote as well the definition from EU technical document "Common Noise Assessment Methods in Europe (CNOSSOS-EU)", i. e.:

Europe is acting to to determine the exposure to environmental noise through strategic noise mapping and elaborate action plans to reduce noise pollution. Since June 2007, EU countries are obliged to produce strategic noise maps for all major roads, railways, airports and agglomerations, on a five-year basis. These noise maps are used by national competent authorities to identify priorities for action planning and by the European Commission to globally assess noise exposure across the EU. This information also serves to inform the general public about the levels of noise to which they are exposed, and about actions undertaken to reduce noise pollution to a level not harmful to public health and the environment.

An interesting quote from the official World Health Organization paper "Burden of disease from environmental noise"

DALYs (disability-adjusted life-years) lost from environmental noise are 61 000 years for ischemic heart disease, 45 000 years for cognitive impairment of children, 903 000 years for sleep disturbance, 22 000 years for tinnitus and 654 000 years for annoyance in the European Union Member States and other western European countries. These results indicate that at least one million healthy life years are lost every year from traffic related noise in the western part of Europe.

The last more than 5 years the author of recent paper, through company SPECTRI Ltd. – Bulgaria successfully finalized directly and indirectly 8 (six) SNM (Strategic Noise Maps), and 10 (ten) AP (Action Plans). Thus we collected vast experience not only re. the process of END noise mapping, but as well re. the on going process of sustainable follow up, and expected publicly available strategic approach for reducing the environment noise impact, combined with dedicated protection of quite zones in the agglomerations.

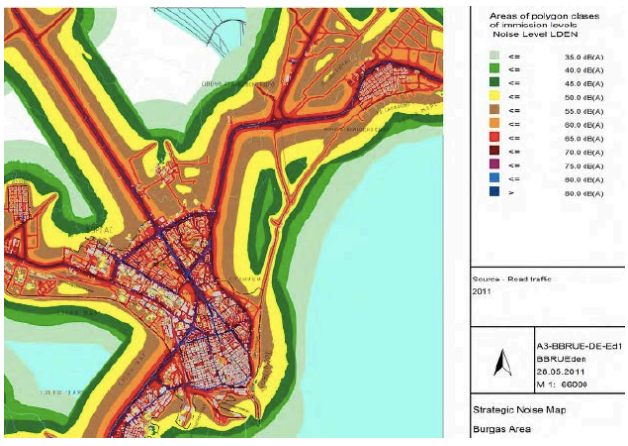

Figure 1. *SNM from SPECTRI extract from Burgas city*

METHODOLOGY, EXPERIENCE

Until 2017 shall be used the recommended by END harmonized assessment methods (see Appendix II - 2.2., recommended methods).

From 2017 is mandatory to generate next stage SNM via the defined by CNOSSOS-EU New Noise Assessment Methods.

Based on his experience SPECTRI Ltd. can recommend and advise the total project's algorithm, shown in Figure 2.

SNM (Strategic Noise Maps):

The quality of SNM is defined by several main requisites:

- quality of input GIS model, and its subsequent dedicated adaptation;
- data for main sources (own collection required)
- verification procedure (procedure needed)
- Used toolkits from EC Good Practice Guide (EC expert noise group paper - WG-AEN)

EXAMLE OF ROAD TRAFFIC CATEGORIZATION FOR SOFIA CITY:

Roads categories (as per own study & GPS tools)	Light Vehicles traffic (per hour) D/E/N	Heavy Vehicles traffic (relative) D/E/N
G (EndNoTraffic**) 6,**13,14,16	12/4/8	12/4/8
F (Dead roads**)** 11,15	128/37/18	0.01/0.01/0.00
E (Service roads**)** 10,17	256/73/37	0.03/0.01/0.01
D (Collecting roads**)** 9,12	511/146/73	0.05/0.03/0.02
C (Small main roads**)** 4,5	1023/292/146	0.08/0.05/0.03
B (Main roads**)** 3,8	2045/584/292/45	0.10/0.08/0.05
A (Major main roads) 1,2,7	3535/1010/505	0.10/0.08/0.05
A0 (Major extra roads) 0	8703/2487/1243	0.25/0.35/0.45

EXAMLE OF RAIL TRAFFIC CATEGORIZATION FOR SOFIA CITY:

TRAIN	**Type**	**N** day	**N** evening	**N** night	**N** vagons
---	---	**day**	**evening**	**night**	**Pcs.**
P_xx	passenger	136	48	41	4
F_xx	freight	57	26	87	20

EXAMLE OF TRAMS TRAFFIC CATEGORIZATION FOR SOFIA CITY:

ITEM	**TRAFFIC**		
TRAM	**N_TR_D**	**N_TR_V**	**N_TR_N**
lines	**DAY**	**EVENING**	**NIGHT**
32	1591	1591	556

An acceptable SNM accuracy of 3dB is to be achieved.

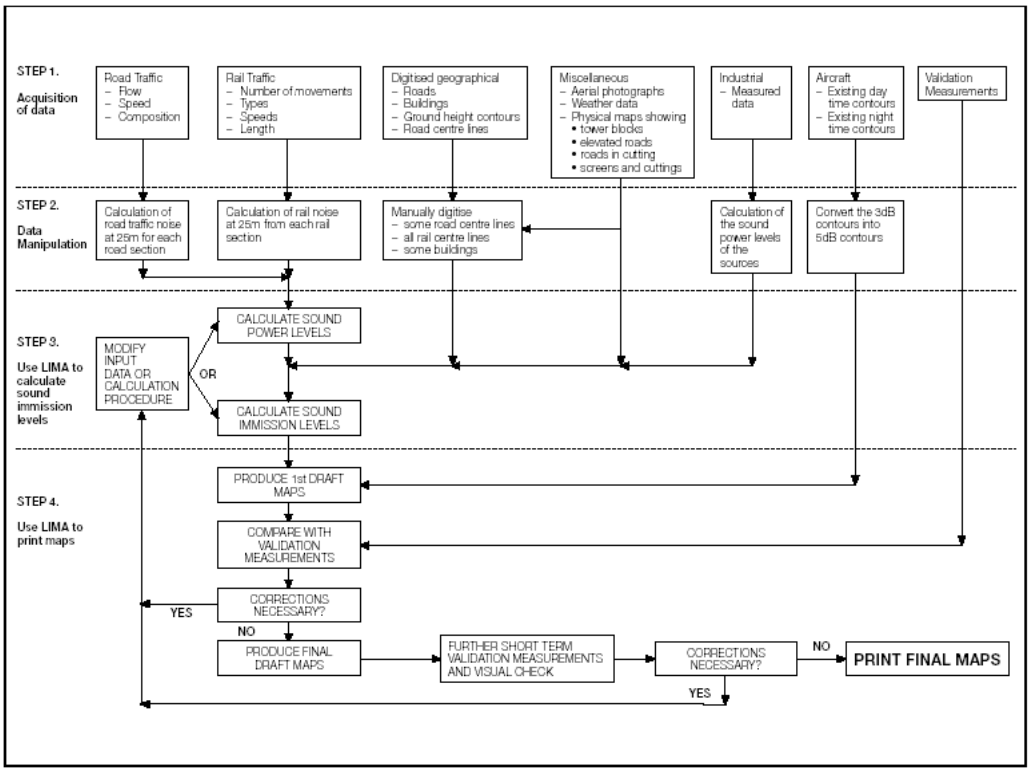

Figure 2. *Main steps re. Strategic noise mapping*

Special attention shall be taken re. methodology of using existing, or organizing new measurements and/or monitoring of noise. A direct ISO1996 measurement and/or monitoring results cannot be implemented in SNM process directly, without careful consideration and undertaken corrections.

Some of the commercially available calculation tools for SNM are offering the so-called "reverse engineering" (correcting the acoustical model with introduced real noise level results). This tool is recommended to use rarely and with big care.

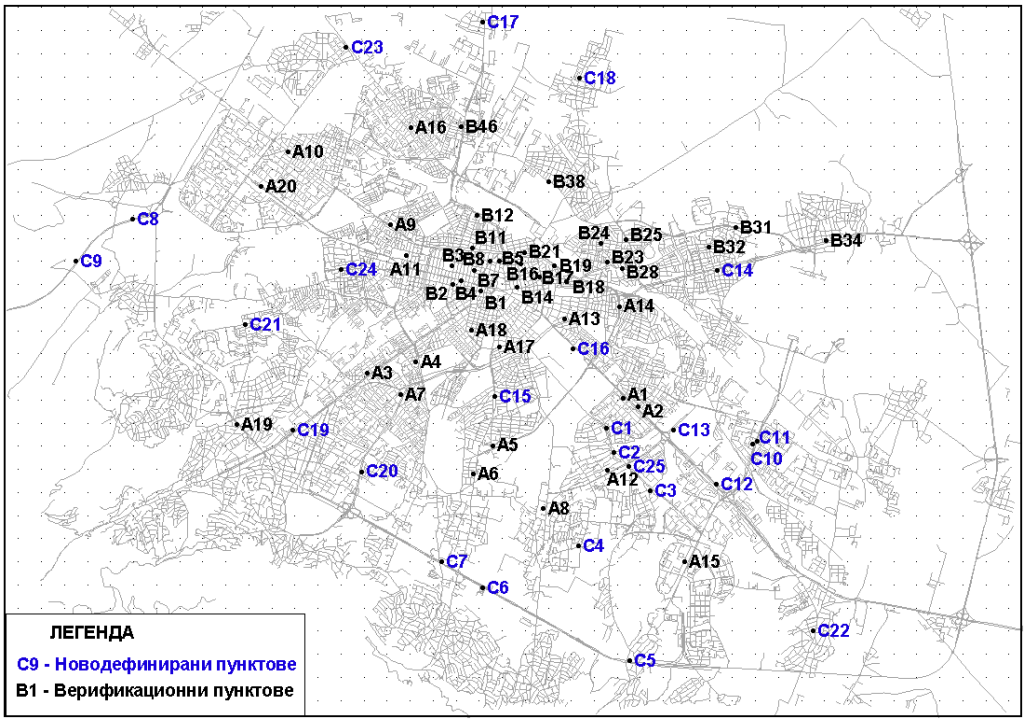

Figure 3.1. *Verification points for Sofia city*

For rough verification purpose can be used available measurement and monitoring data base (see Figure 3.1.-3.2).

Point ID	**Address**	Laeq, dB	Laeq-LIMA	**L24H/LIMA/ - LEQ /EV.M/**
C 1	bul.Makedoniya i ul.20-ti april	64.5	68.89	**-4.39**
C 20	ul.Zhitnitsa i ul.Kyustendzha	71.5	73.79	**-2.29**
C 21	bul.Gotse Delchev 31	74.5	76.28	**-1.78**
C 25	bul. Aleksandar Stamboliyski i ul.Lavele	63	65.34	**-2.34**
C 3	gara Poduyane	75.3	72.64	**2.66**
C 31	ul.Tsvetan Radoslavov i ul.Galileo Galiley	58.5	57.71	**0.79**
C 35	II MBAL bul.Hristo Botev	68	67.14	**0.86**
C 36	II SAGBAL, ul.Sheynovo 19	62	64.07	**-2.07**
C 44	zh.k. Druzhba, bl.96	55.5	58.36	**-2.86**
C 45	ul.Kievska i ul.Novo selo	56.9	59.56	**-2.66**
C 46	ul.Georgi izmerliev 24 DKTS	66	63.06	**2.94**
C 5	bul.Konstantin Velichkov i ul.Pirotska	71.5	73.62	**-2.12**
C 8	bul.Tsarigradsko shose i ul.Latinka	77.5	75.92	**1.58**

Figure 3.2. *Example for verification calculations in selected monitoring points in Sofia city*

SNM performer has to provide, even for verification purposes own argumented methodology for obtaining main END indexes - Lden & Lnight.

$$L_{den} = 10\lg\frac{1}{24}\left(12*10^{\frac{L_{day}}{10}} + 4*10^{\frac{L_{evening}+5}{10}} + 8*10^{\frac{L_{night}+10}{10}}\right)$$

Figure 4. *L_{den} calculation*

AP (Action Plans)

For all direct and concrete noise reduction measures shall be provided calculation of prognostic effect – using the recommended by END harmonized assessment methods (see Appendix II - 2.2., recommended methods)., and from 2017 the defined by CNOSSOS-EU New Noise Assessment Methods.

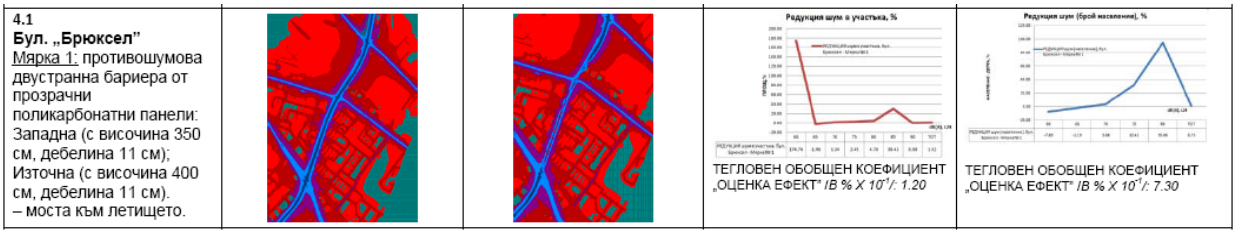

Figure 5. *Real action measure calculation quote*

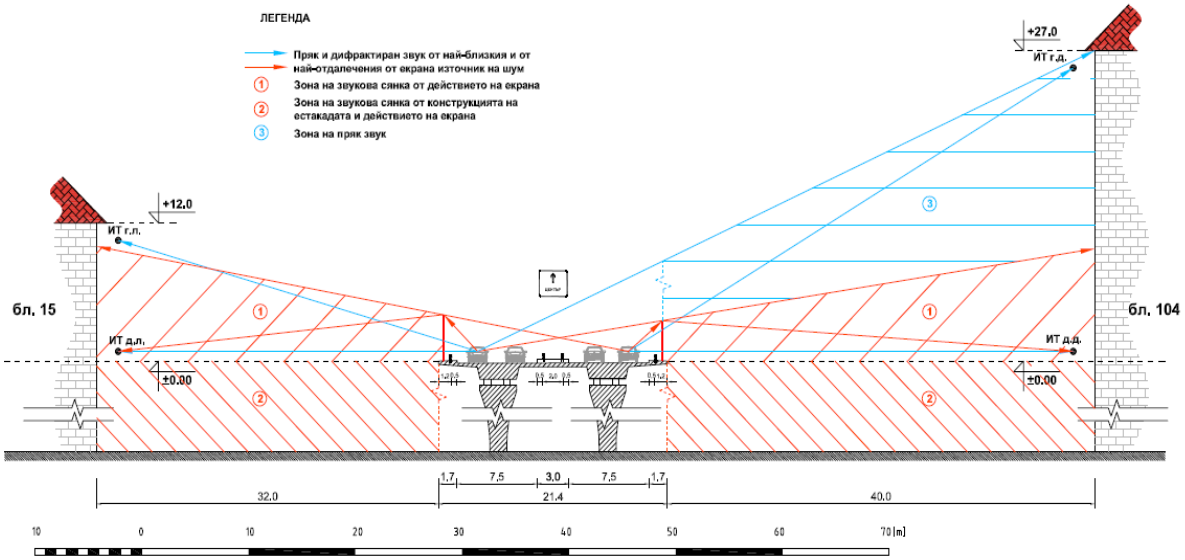

Figure 6. *Acoustical measure – noise barrier, design phase*

Figure 7. *Acoustical measure – noise barrier, real set-up*

In a final AP document, one shall include variety of measures, i. e.:

- organizatorical global measures, with overall acoustical impact
- investment environmental projects, with overall acoustical impact
- public campaigns and measures with indirect acoustical impact
- measures on state and even cross border measures - with direct and indirect acoustical impact
- measures with direct acoustical impact (such as barriers, large green zones, traffic improvement, etc.)

CONCLUSIONS

Main practical advises, and conclusions from SPECTRI experience and Non Governmental involvement in Environmental Prediction process (through Bulgarian Acoustical Association):

- Collection of maximum possibly correct input data is achieved either through available sources, or collecting via different institutions' collaboration, or using own collective procedure and argumented methodology.
- Using measurement and monitoring data (available ones), and further organizing of own measurements and traffic counts. Needed own argumented methodology for introducing measurement data into SNM process, and for verification procedure.

SPECTRI www.WEBNOISE.eu.

Figure 8. *SPECTRI WEBNOISE.eu portal*

- Producing reliable, accurate and trustful tool for professional strategic noise impact reduction and noise protection – the END defined Action Plans, organized and created with care.
- Important practical conclusion is that the SNM and AP are to be created with same methodology, and possibly by the same performer.
- Publicly available data in a clear, attractive, and easy understood format. One example is the maintained by SPECTRI own environmental on-line protection portal - seem http://www.webnoise.eu - See Figure 8.

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STRATEŠKO MAPIRANJE BUKE I AKCIONO PLANIRANJE. ISKUSTVO, PRAKTIČNI ZAKLJUČCI

Boris Mihaylov

Rezime: *Na osnovu Direktive Evropskog parlamenta o proceni i upravljanju bukom u životnoj sredini iz 2002. godine (END - Direktiva 2002/49/EC), godine 2005. je u zemljama članicama EU započet intenzivan proces mapiranja buke. Neke od zemalja su imale izuzetnu praksu u kreiranju mapa buke u prošlosti. Direktiva je utemeljila novi put sa ciljem harmonizacije globalnog strateškog pristupa smanjenju buke od osnovnih izvora buke u životnoj sredini koji izazivaju štetan uticaj na zdravlje stanovnika EU. Autor ovog rada ima bogato iskustvo u kreiranju strateških karata buke i strateškom planiranju buke, uglavnom u Bugarskoj. U radu je prikazan kratak pregled dobijenih rezultata i zaključaka. Krajnji cilj je da se utvrde konkretni akcioni planovi na osnovu strateškog menadžmenta bukom (restrikcija i smanjenje uticaja buke na životnu sredinu), kao i da se primeni niz mera u okviru kratkoročnog i dugoročnog akustičkog planiranja.*

Ključne reči: strateška karta buke, akcioni plan, buka u životnoj sredini.