



الجمهورية العربية السورية
هيئة الطاقة الذرية

هـ ط ذ س - و / ت د ع 562
كانون الثاني 2004

تقرير عن دراسة علمية ميدانية
قسم الوقاية

التلوث الضوضائي في مدينة دمشق القديمة

إعداد

د. يوسف مسلماني

د. محمد العودات

:

.Noise pollution

(LA_{eq})

:

Neutrik

NC-10

20

3600

.A-

140

.2003

2002

(LA_{eq})

A-

14

A-

18

)

%95

Percentile

(

%99

%90

- ()
19 11 A- 11 -

A-

:

(AFNOR)

(1991 Botte and chocholle)

.(2001 Shukla and chand el) Noise pollution

()
A-
.(1999 Sandberg 1999 long)

)
Frequency
.Hertz cycle ()
()
/ 20000 20
/ 4000 1000
6000 200
(Infrasonic) / 16
/ 20000
(Ultrasonic)

:

20

(100 20)

100

Decibel (dB)

$$1 \text{ dB} = 20 \log_{10} \left(\frac{P}{P_{ref}} \right)$$

20

P_{ref}

P :

:

200

$$= 20 \log_{10} \left(\frac{200}{20} \right) = 20 \log 10 = 20$$

(1)

20

10

:

:

Road traffic

-1

1994)

(1)

%40

(Lambert and vallet

) A- 55

%20

(

%30

A- 65

A- 55
(1998 Mage and Walsh)

80-75

(1999 Ahmad, 2000 Shaik and Shaik, 1995 WHO)

.A-

%80-60

()

-

- 2

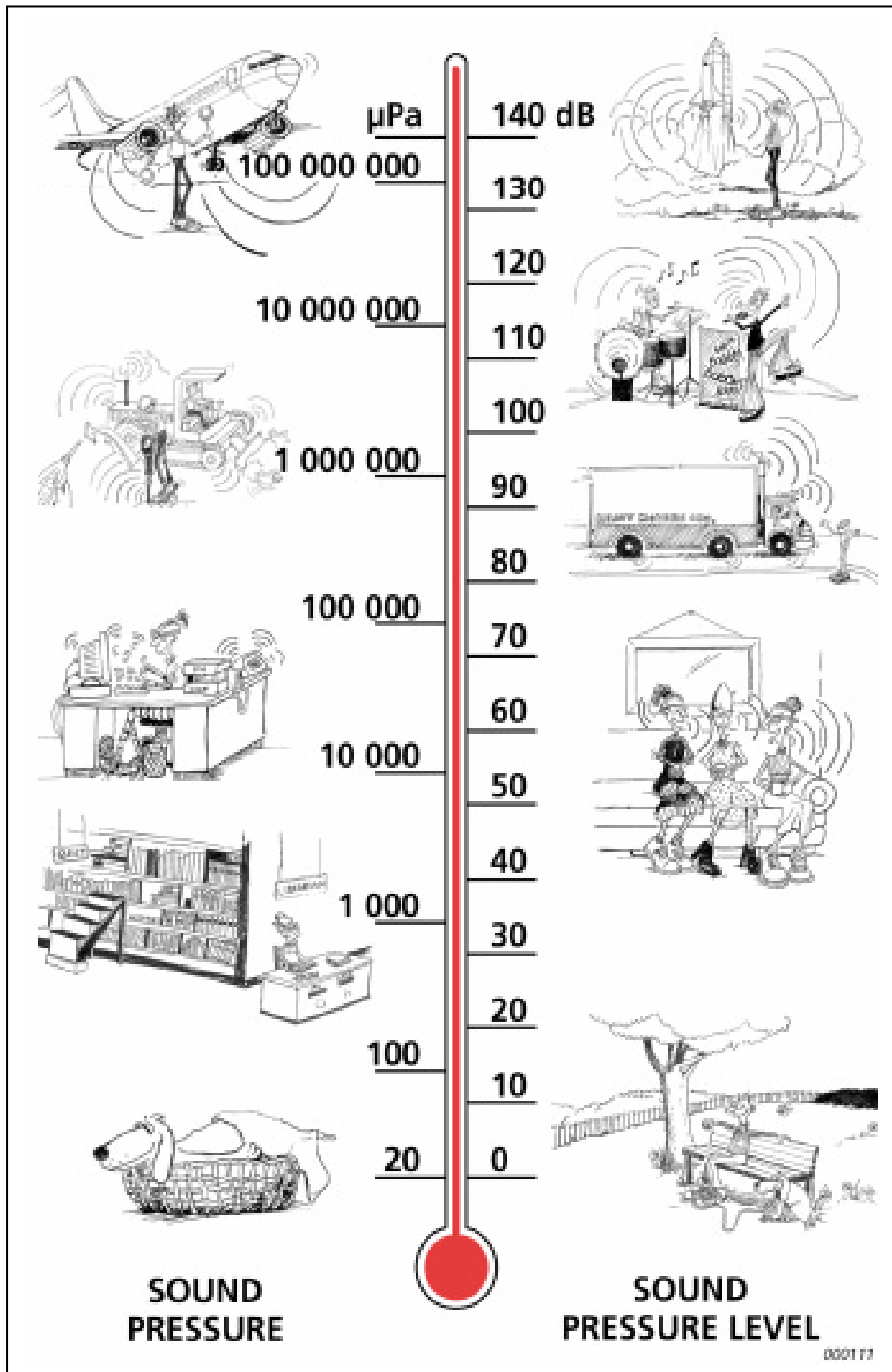
-

-3

(1995 WHO)

(1)

80-75 (%)		80-60 (%)
82.3		
79.5	73.4	
4.2	4.6	
2.3	2.4	
9.0		
6.2		
2.5		



() .

()

(1)

:

.(2001 Shukla and Chandel)

(1986 Jansen) OECD

:(2)

A- 55 -

A - 60 55 -

A - 65 60 -

Annoyance

A- 65 -

(2)

(1986 Jansen)

(A-)

(2)

متوسط مستوى الضجيج (A-)			Noise Effects ()
LA _{max} (الأعظمي)	LA _{eq} (المكافئ)		
داخل المنازل	داخل المنازل	خارج المنازل	
40	38	-	
40	-	-	
-	45	-	
-	-	45-55	(%20)
55	-	-	%99
60	-	-	()
-	-	65	(%15-5 %70 – 30)
70-85	-	-	
75	-	-	()
85-100	-	-	()
-	-	80	
-	85	-	
100	-	-	
> 100	-	-	
> 130	-	-	

1986 1991 Botte and Chocholle 1995,2000 WHO 1996 lercher)

(1972 Karagodina Nikitin and Novikov

(Physiological effects)

:

:

(1

-

:

-

A- 75 – 70

1999 ISO,)

A - 75
() A- 85 80
8

(Chouard 2001

(1995) WHO

() Socioacousia
120 (1998 smith) .Presbacousia

: (2

Autonomic nervous system

Reticular nervous system

-

-

:

-

:

-

:

-

(1993 Babisch et.al)

(1995 Berglund and lindvall, 1980 Cohen et al.)

.(1999 Babisch et al.)

(1989 Ohostrom)

-

(1980 Tarnopolsky et al.)

-

.(1986 Nikitin and Novikov)

-

1992)

(Standfeild

2001)

.(Chouard

(1993 Ohostrom, 1991 Botte and Chocholle)

A- 45-40

:Psychological effects

-

(1988 Jop, 1980 Tranopolsky)

A- 50

.

.

(2001 Klaeboe et al.)

.

:

-

(1972 Karagodina, 1986 Nikitin and Novikov, 1994 Kryter,

2000 WHO)

.

(1994 Kryter)

.

()
2002 2003

(3)

	/			
	611±122	-		
	675±116	-		
	421±057	-		
	316±092	-		
	1829±492			
	494±129			
	539±139			
	-			
	105±065			
	034±020			
	-			

:

Neutrik NC-10

C B A :

A

A- 140 20

:

.(LA_{eq})

.(LA_{max})

.(LA_{min})

.(LA Peak_{max})

-

-

-

-

.Percentile

60

3600

21:00-20:00

.()

•
•
•
•
•
•

.12:00 10:00
.15:00 13:00
17:00 16:00
.19:00 18:00
.21:00 19:00

.(1995 WHO)

:

:

(L_{Aeq})

5 4

(7 6)

65.8

-

A-

74.4

71.6

2002

A-

67.8

A-

77.8

2002

2003

A-

78.9

61.9

-

A-

73.7

70.8

A-

63.1

(2002).

(A-) الضجيج

(4)

LAPEAK_{max}	LA_{max}	LA_{min}	LA_{eq}		
101.8±3.5	95.2±4.4	57.4±1.6	71.6±2.5	-	
112.7±5.2	99.4±5.4	56.5±1.5	73.9±2.2	-	
110.0±4.9	96.9±2.5	54.5±1.5	74.7±3.6	-	
112.3±4.3	98.8±5.4	53.6±2.9	74.3±2.3	-	
110.9±3.9	98.2±5.0	60.0±3.1	75.2±2.0		
113.7±3.5	101.2±3.4	61.7±2.1	77.8±1.0		
115.9±6.9	110.3±3.8	53.5±1.9	76.4±3.8		
100.0±3.1	85.7±1.9	56.5±3.6	65.8±2.9		
110.5±7.0	99.1±8.2	51.6±3.7	71.5±6.1		
110.4±11.9	95.7±8.8	50.9±1.0	69.4±5.3		
108.0±6.4	94.4±9.0	50.8±4.2	67.8±5.6		

(2003).

(A-)

(5)

LAPEAK_{max}	LA_{max}	LA_{min}	LA_{eq}		
110.9±3.8	98.9±2.1	59.2±2.6	73.7±2.4	-	
111.4±3.1	99±4.1	56.8±1.4	70.8±1.4	-	
109.2±2.7	95.2±3.7	55.3±1.3	72.0±1.7	-	
110.6±4.1	98.2±5.1	51.1±1.4	71.1±4.3	-	
111.9±2.8	99.1±2.1	62±1.6	76.5±2.1		
114.5±3.6	102.6±3.7	61.9±1.4	77.4±3.0		
112.3±3.4	100.8±3.6	56.4±3.4	78.7±3.9		
99±8.8	82.3±5.8	55.4±4.5	61.9±3.6		
111.3±7.7	94.3±2.9	53.0±0.8	68.8±1.8		
105.2±6.2	52.5±5.5	51.4±2.0	66.4±3.0		
101.3±4.2	87.1±7.8	51.9±3.20	63.1±3.2		

(A-)

(6)

35	45	35	45	35	45	
40	50	40	50	40	50	
45	55	45	55	45	55	
50	60	50	60	50	60	
50	65	55	65	55	65	
60	70	60	70	-	-	
-	-	-	-	40	50	

) (A-)

(7)

.¹(2003

		2	
55-45	60-50	65-55	
50-40	55-45	60-50	
45-35	50-40	55-45	
40-30	45-35	50-40	
35-25	40-30	45-35	
60-50	65-55	70-60	

()

(1) A- 10

-2002 -

(10) 1

10

.07:00-22:00 22:00-18:00 : 18:00-07:00 : 2

A- 10
 2003
 A- 10
 .(A- 10)
 (A- 12)
) (7)
 A- 14 11 ()
 A- 14 0 -
 A- 13 2002 A- 18
 () 2003
 20 ()
 10 (A- -100 80) A-
 .(1)
 5.3 3.8 2002
 7.8 4.4 1.1 -
 2003
 4.8-0 - 4.8-3.5
 .(8) 4.5

(μPa) (A-) (8)
2002 (1)

()	(A-) dB	μPa	dB	() μPa	(A-) dB	
5.3-3.8	14.4-11.6	20000	60	104760-76040	74.4-716	-
4.4-1.1	12.8-0.8	35570	65	155250-39000	77.8-65.8	
7.8	17.8	6320	50	49.090	67.8	

2003 (2)

4.8-3.5	13.7-10.8	20000	60	96830-69350	73.7-70.8	-
4.8-0	13.7	35570	65	172200-24890	78.7-61.9	
4.5	13.1	6320	50	28580	63.1	

:

(5 4)

61.7 51 - A- 57.4 53.6
A- 51 A-
A- 59.2 51.3 2003 2002
52 A- 62.0 51.4 -
2 5 4 . A-
 $L_{A_{eq}}$
) (A- 59.2)
(A- 62.0
(A- 52-51)
(A- 50.0)
($L_{A_{eq}}$)
A- 5-4
A- 10
(2)

:

				(5 4)		
A-	102.6	87.1	2002	A-	101.2	94.4
						2003
			2003	2002	A-	82.3 85.7
				(2)		
A-	114.5	99	2002	A-	116	100
						.2003
			(2)			
				(4 3)		

:Percentile

	3600				NC-10
-					
(9)					
	%1	2002			
%50	A-	81.3		()	
59.8		%99	A-	65.7	
					.A-
				%95 (10 9)	
	(A-	- 60)			
)	%90				

(A- 65)

(%90

%99

(A- 50)

.(2002) Percentile (9)

%99	%95	%90	%50	%10	%5	%1	
59.8	61.2	62.0	65.7	72.6	75.2	81.3	
59.5	61.7	62.9	67.8	75.1	77.6	84.0	
58.3	60.4	61.8	67.6	77.1	79.8	85.0	
56.5	58.9	60.4	67.2	75.8	78.4	84.8	
62.6	64.2	65.2	69.3	77.1	80.1	86.1	
64.3	65.8	66.7	71.0	79.0	82.3	89.5	
56.9	59.6	61.2	67.5	76.7	81.0	88.4	
57.7	58.5	59.0	61.9	68.3	71.1	75.7	
54.6	56.3	57.4	63.0	70.5	73.3	79.4	
53.1	54.5	55.4	59.8	68.2	72.4	80.1	
52.7	54.0	54.8	58.6	66.3	70.0	77.9	

.(2003) Percentile (10)

%99	%95	%90	%50	%10	%5	%1	
61.1	62.8	63.6	66.8	72.9	75.8	84.7	
58.7	60.4	61.5	66.4	73.6	76.5	83.9	
58.0	60.0	61.3	66.5	74.3	76.8	82.3	
54.7	56.4	57.6	64.1	72.2	75.1	81.1	
64.3	65.8	66.7	70.8	78.2	81.0	87.3	
64.0	65.6	66.5	70.8	78.1	81.1	89.1	
59.6	61.8	63.3	69.2	79.1	83.5	90.5	
56.5	57.2	57.6	59.7	64.0	65.8	96.7	
55.4	57.1	58.2	63.3	70.4	72.8	79.0	
53.3	55.1	55.6	60.3	67.6	70.3	76.2	
53.6	54.6	55.2	58.5	65.3	67.7	72.6	

(%10) %10

(11)

(A-)				
LAPEAk_{max}	LA_{max}	LA_{min}	LA_{eq}	
99.5	85.1	50.1	65.9	
75.3	62.4	37.4	47.8	
91.6	80.5	53.9	61.9	
105.1	92.3	53.6	61.2	

Percentile

12

%99	%95	%90	%50	%10	%5	%1	
52.4	54.8	55.9	60.8	69.1	71.8	76.9	
39.3	40.6	41.6	45.8	51.0	52.5	55.6	
54.9	55.7	56.2	59.1	64.7	66.7	70.7	
54.2	55.1	55.5	57.6	61.0	62.2	66.3	

:

(11)
3

(A- 65)

%10 (12)
%5 (A- 69.1)

:

($L_{A_{eq}}$)

()

A- 14

A- 18-13

-

8

-

5

-

%95

%90

%99

)

-

(

-

)

A- 101 ()
.A- 116 100

A- 95 (

()

-

-

16:00

()

.

()

:

-

()

A- 77

()

A- 65.8

A- 11

.

-

()

. A- 19 11

() : -1

-2

) (-3

-4

:

:

LA_{eq} -

- A- 14

A- 18

) %95 Percentile -

(

%90

%99

11

A- 19-11

A-

7 16

()

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2002 50 . .25
.2003 .2003 30

(Appendix)

(A-)

(1)

2002

(1)

Range	LA _{Eq}							Sites
		21-19	19-18	17-16	15-13	12-10	8-7	
74.6-68.2	71.6±2.5	68.2	74.6	69.9	71.1	74.2	71.3	
76.8-70.2	73.9±2.2	74.6	70.2	73.8	76.8	73.4	74.6	
81.1-70.7	74.7±3.6	73.7	71.8	81.1	76.5	74.1	70.7	
78.0-71.8	74.3±2.3	75.1	73.3	75.5	71.8	78.0	72.2	
78.1-72.6	75.2±2.0	73.4	75.5	75.4	78.1	76.0	72.6	
78.9±76.3	77.8±1.0	77.5	78.9	78.3	77.4	76.3	78.6	
84.0-73.3	76.9±3.8	76.2	77.0	84.0	73.3	76.5	74.3	
68.4-60.4	65.8±2.9	68.4	65.6	68.2	66.3	65.8	60.4	
82.6-65.5	71.5±5.2	69.4	67.5	82.6	73.2	70.6	65.5	
77.1-62.9	69.4±5.3	77.1	65.4	66.8	73.2	62.9	71.0	
78.3-61.0	67.8±5.9	61.0	66.8	78.3	65.0	66.0	69.4	

2003

(2)

Range	LA _{Eq}							Sites
		21-19	19-18	17-16	15-13	12-10	8-7	
76.9-70.2	73.7±2.4	72.1	70.2	73.1	76.9	74.5	75.2	
74.5-70.8	73.0±1.4	72.5	70.8	72.9	72.7	74.5	74.4	
74.6-70.0	72.0±1.7	71.8	74.6	72.8	70.0	72.6	70.4	
79.3-67.5	71.1±4.3	67.5	71.3	69.0	79.3	70.8	68.7	
80.6-74.7	76.5±2.1	75.5	74.7	76.3	76.7	80.6	75.6	
83.0-74.7	77.4±3.0	74.7	76.8	77.6	83.0	76.7	75.3	
82.3-74.0	78.7±3.9	75.3	76.3	81.7	82.3	82.3	74.0	
65.6-55.4	61.9±3.6	60.8	62.3	65.6	63.7	63.5	55.4	
70.8-66.5	68.8±1.8	67.0	70.8	68.3	70.4	69.5	66.5	
70.7-63.0	66.4±3.0	67.8	63.0	68.1	70.7	63.3	65.5	
66.6-57.8	63.1±3.2	65.7	63.0	66.6	61.3	64.1	57.8	

(A-)

(2)

2002

(1)

Range	LA _{min}							Sites
		21-19	19-18	17-16	15-13	12-10	8-7	
60.3-56.1	57.4±1.6	56.1	56.1	57.7	56.6	60.3	57.6	
58.4-54.0	56.5±1.5	57.6	54.0	56.2	56.4	58.4	56.5	
56.5-51.1	54.5±1.5	54.1	53.2	56.4	55.8	56.5	51.1	
57.5-49.3	53.6±2.9	57.5	52.4	55.6	54.7	51.9	49.3	
63.4-53.8	60.0±3.4	61.5	63.4	58.5	60.6	62.1	53.8	
63.6-58.8	61.7±2.1	59.1	62.9	62.7	63.0	63.6	58.8	
55.7-50.3	53.5±1.9	55.7	54.8	53.4	52.7	53.8	50.3	
59.3-49.9	56.5±3.6	58.8	58.9	59.3	56.4	55.8	49.9	
54.7-44.6	51.6±3.7	50.9	54.7	53.2	53.6	52.7	44.6	
51.8-49.2	50.9±1.0	51.3	51.8	51.8	51.1	50.4	49.2	
54.1-42.8	50.8±4.2	52.7	53.4	54.1	52.4	49.3	42.8	

2003

(2)

Range	LA _{min}							Sites
		21-19	19-18	17-16	15-13	12-10	8-7	
61.7-54.7	59.2±2.6	60.2	61.7	54.7	60.0	60.8	57.6	
58.1-55.0	56.8±1.4	57.3	57.1	55.1	58.1	58.0	55.0	
57.2-54.0	55.3±1.2	54.4	54.0	55.0	55.4	57.2	55.7	
54.8-51.1	52.1±1.4	51.7	51.7	52.1	54.8	51.1	51.8	
64.1-59.6	62.0±1.6	63.2	62.2	61.0	62.0	64.1	59.6	
63.6-59.2	61.9±1.4	62.7	62.3	61.7	63.6	62.0	59.2	
58.6-49.7	56.4±3.4	57.4	58.6	58.2	58.1	56.4	49.7	
59.8-48.9	55.4±4.5	52.8	52.7	59.8	58.8	59.3	48.9	
53.9-51.8	53.0±0.8	53.8	53.9	52.6	51.8	53.0	52.8	
54.1-48.0	51.4±2.0	51.5	51.4	52.4	54.1	50.7	48.0	
54.8-46.7	51.9±3.2	54.8	54.8	53.6	51.2	50.3	46.7	

(A-)

(3)

2002

(1)

Range	LA _{max}							Sites
		21-19	19-18	17-16	15-13	12-10	8-7	
100.5-89.0	95.2±4.4	89.0	99.5	91.9	95.8	100.5	94.7	
106.6-92.3	99.4±5.4	102.6	92.3	97.3	106.0	95.0	102.7	
102.0-86.7	96.9±2.5	97.7	100.4	95.6	102.0	99.2	86.7	
104.5-92.8	98.8±5.4	103.8	92.8	102.7	93.8	104.5	95.4	
104.4-92.6	98.2±5.0	94.8	104.4	92.8	103.9	98.6	94.5	
106.5-96.6	101.2±3.4	101.5	106.5	96.6	98.6	102.0	102.2	
106.0-95.1	100.3±3.8	100.6	106.0	101.2	95.1	101.2	97.4	
88.5-82.9	85.7±1.9	85.2	86.3	82.9	88.5	86.5	84.8	
112.3-89.8	99.1±8.2	96.2	89.8	112.3	104.6	98.5	93.4	
110.6-84.3	95.7±8.9	110.6	90.4	93.8	98.5	84.3	96.7	
103.7-79.1	94.4±9.0	79.1	97.1	102.6	91.2	92.6	103.7	

2003

(2)

Range	LA _{max}							Sites
		21-19	19-18	17-16	15-13	12-10	8-7	
101.4-96.1	98.9±2.1	96.1	99.4	96.7	100.1	99.8	101.4	
104.9-93.9	99.0±4.1	102.8	93.9	98.2	96.8	97.1	104.9	
99.5-90.4	95.2±3.7	99.5	99.0	96.9	94.4	90.4	91.0	
107.6-93.5	98.2±5.1	93.5	99.2	97.6	107.6	97.0	94.4	
101.4-95.6	99.1±2.1	100.4	95.6	100.0	97.6	101.4	99.6	
109.4-98.9	102.6±3.7	100.3	103.0	101.3	109.4	102.8	98.9	
106.2-95.1	100.8±3.6	101.5	101.0	100.0	100.9	106.2	95.1	
87.6-72.1	82.3±5.8	87.6	88.0	82.3	83.2	80.4	72.1	
97.9-89.3	94.3±2.9	94.3	95.5	93.6	95.3	97.9	89.3	
99.5-85.7	92.5±5.5	98.2	90.9	92.6	99.5	85.7	88.2	
98.6-75.8	87.1±7.8	89.1	83.1	98.6	75.8	91.3	84.6	

(A-)

(4)

2002

(1)

Range	LAPEAK _{max}							Sites
		21-19	19-18	17-16	15-13	12-10	8-7	
112.2-101.8	108.5±3.5	101.8	109.3	109.6	108.2	112.2	109.7	
118.0-105.8	112.7±5.2	117.0	105.6	108.6	118.0	110.1	116.6	
119.3-101.4	110.0±4.9	110.7	113.2	106.6	119.3	108.7	101.4	
116.4-106.4	112.3±4.3	116.4	106.4	115.6	107.2	113.5	114.4	
115.7-106.4	110.9±3.9	109.5	115.6	106.4	115.7	109.8	108.3	
118.3-108.7	113.7± 3.5	114.7	118.3	108.7	110.5	115.2	114.9	
125.1-109.4	115.9±6.9	125.1	116.4	110.7	123.3	110.7	109.4	
105.2-97.4	100±3.1	97.7	101.0	97.4	105.2	101.0	97.6	
120.4-103.3	110.5±7.0	115.7	103.3	120.4	113.0	105.9	104.4	
125.8-97.3	110.4±11.8	122.7	98.7	108.1	125.8	97.3	109.7	
113.9-97.5	108.0±6.4	97.5	111.4	113.0	103.1	108.9	113.9	

2003

(2)

Range	LAPEAK _{max}							Sites
		21-19	19-18	17-16	15-13	12-10	8-7	
118.1-107.7	110.9±3.8	107.9	118.1	107.7	109.5	110.8	111.4	
115.6-107.0	111.4±3.1	111.3	107.0	114.4	110.0	110.3	115.6	
111.5-104.4	109.2±2.7	111.5	109.7	109.9	108.3	104.4	111.3	
118.1-105.8	110.6±4.1	109.6	110.3	111.3	118.1	108.5	105.8	
116.4-108.0	111.9±2.8	113.2	108.0	111.7	111.0	116.4	110.9	
120.7-109.5	114.5±4.0	116.1	114.3	111.2	120.7	115.3	109.5	
117.1-106.6	112.3±3.4	113.0	112.2	112.0	112.9	117.1	106.6	
113.5-87.0	99.0±8.8	102.4	113.5	96.4	95.6	98.8	87.0	
125.8-103.3	111.3±7.7	125.8	110.4	110.0	106.7	111.6	103.3	
114.5-98.2	105.2±6.2	114.5	100.0	104.4	110.1	98.2	103.7	
107.1-96.3	101.3±4.2	98.7	101.6	107.1	98.9	105.2	96.3	

Noise pollution in the old city of Damascus

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Abstract

Outdoor noise levels were measured at 11 sites in the old city of Damascus. Sound level meter Model NC- 10 with a 20-140 dB selectable range was used in the current investigation. At each site noise data was collected during 07:00 to 20:00 O'clock. The results showed that the noise levels were higher than WHO (World Health Organization) stander by 14 dB, in the residential – commercial sites, and commercial sites with heavy traffic, and by 18 dB, in the square of Omayad Mosque in the center of the old city, where there was no traffic. In commercial caravansaries "Khans" the noise levels were acceptable. The study showed that the authorities administration must take necessary procedures the noise levels in the old city of Damascus, throw reducing and organizing the traffic flow in the old city.

Key Words: Noise pollution, old Damascus, outdoor sound levels.

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Department of Protection and Safety

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