Project funded by
European Union

AIR QUALITY GOVERNANCE IN
THE ENPI EAST COUNTRIES
AIR-Q-GOV

EuropeAid/129522/SER/MULTI

MWH
BUILDING A BETTER WORLD

Project implemented by
MHW led Consortium

Moldova's experience with The THOR-AirPAS system

Pilot city: Chisinau (municipality)

Contents:

1. *Urban Background Model (UBM)*
2. *Operational Street Pollution Model (OSPM)*
3. *Conclusions*
4. *Future plans with the THOR-AirPAS system*

1. Urban Background Model (UBM)

Input data:

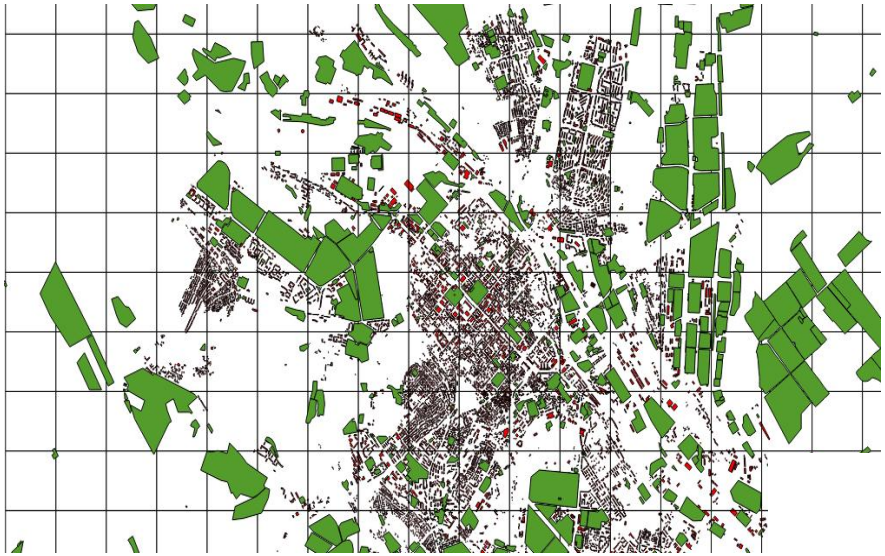
Table 1. Example of input from the emission model for point sources to the spatial distribution for Chisinau mun., 2009

SNAP	X coordinate	Y coordinate	Projection	Stack height	NOx	SO2	CO	…
01	642451,9	5209926	WGS84_UTM35N	150	101,69	0,06	103,275	
01	642451,9	5209926	WGS84_UTM35N	150	6,8841	23,99	0,73204	
01	643607,6	5210170	WGS84_UTM35N	150	542,89	184,3	419,890	
01	643607,6	5210170	WGS84_UTM35N	150	55,073	191,9	5,85638	
01	638700,4	5205976	WGS84_UTM35N	90	86,909	0,279	38,8487	
01	637393,6	5211320	WGS84_UTM35N	100	19,619	0,364	50,5433	
03	643838,6	5208476	WGS84_UTM35N	50	82,5	3,102	0	
03	643988	5209283	WGS84_UTM35N	50	29,058	0,38	0	
03	644946,8	5206341	WGS84_UTM35N	50	13,192	1,967	5,69640	

Table 2. Example of input from the emission model for area sources to the spatial distribution for Chisinau mun., 2009

SNAP	GridID	X	Y	Projection	NOx	SO2	CO	PM10
02	1km_5202_639	639500	5202500	WGS84_UTM35N	0,022	0,0041	0,01	0,000
02	1km_5202_641	641500	5202500	WGS84_UTM35N	0,088	0,0164	0,05	0,001
02	1km_5203_639	639500	5203500	WGS84_UTM35N	0,085	0,0158	0,05	0,001
…..	……	…..	…..	…….	……	…..	…..	……
03	1km_5214_640	640500	5214500	WGS84_UTM35N	0,795	1,7474	2,05	0,234
03	1km_5214_641	641500	5214500	WGS84_UTM35N	0,061	0,1355	0,15	0,018

Spatial land use (a) and road network (b) databases for Chisinau mun.



(a)

(b)

Spatial distribution keys based on road network, buildings and population density

GridID	ShareOfLength
1km_5204_644	0,008088369
1km_5204_645	0,000253929
1km_5205_643	0,024976065
1km_5205_644	0,029481056
1km_5205_645	0,000957017
……	…….
1km_5211_640	0,011043289
1km_5212_635	0,006445894
1km_5212_636	0,022436871
1km_5212_637	0,0200756
Grand Total	1

GridID	ShareOfUrbanArea
1km_5202_639	0,001047282
1km_5202_640	0,000456296
1km_5214_636	0,001744657
……	……
1km_5214_638	0,003589364
1km_5214_639	0,002189424
1km_5214_640	0,001252174
Grand Total	1

Grid ID	ShareOfBuildArea
1km_5202_639	0,000705925
1km_5202_641	0,000878868
1km_5203_638	0,00597268
1km_5203_639	0,00252563
1km_5203_640	0,002782508
…….	……
1km_5214_636	0,001019437
1km_5214_637	0,000281033
1km_5214_639	0,002914094
1km_5214_640	0,001842085
Grand Total	1

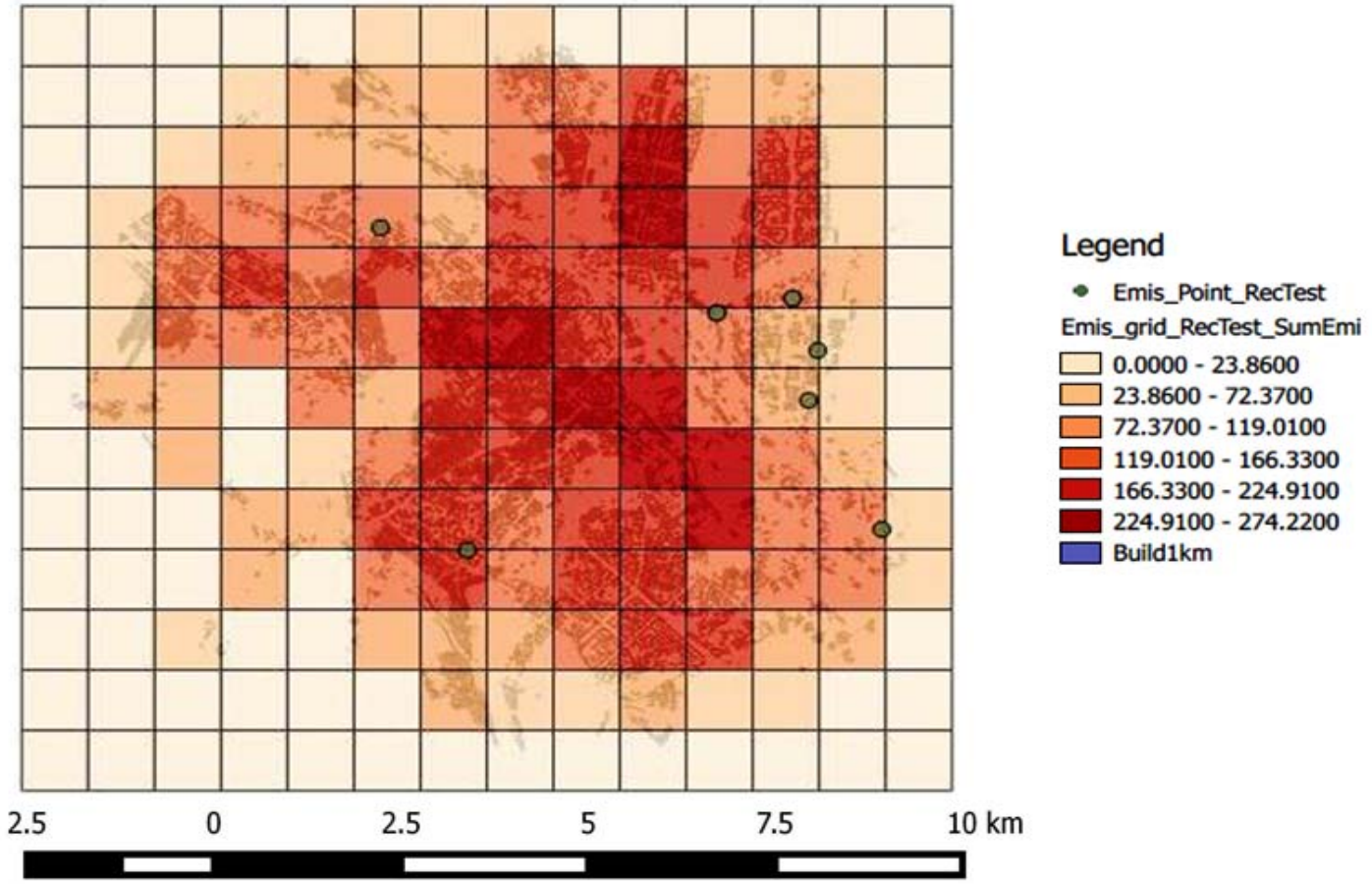
Output data:

Concentration of pollutants in Chisinau mun. in 2009

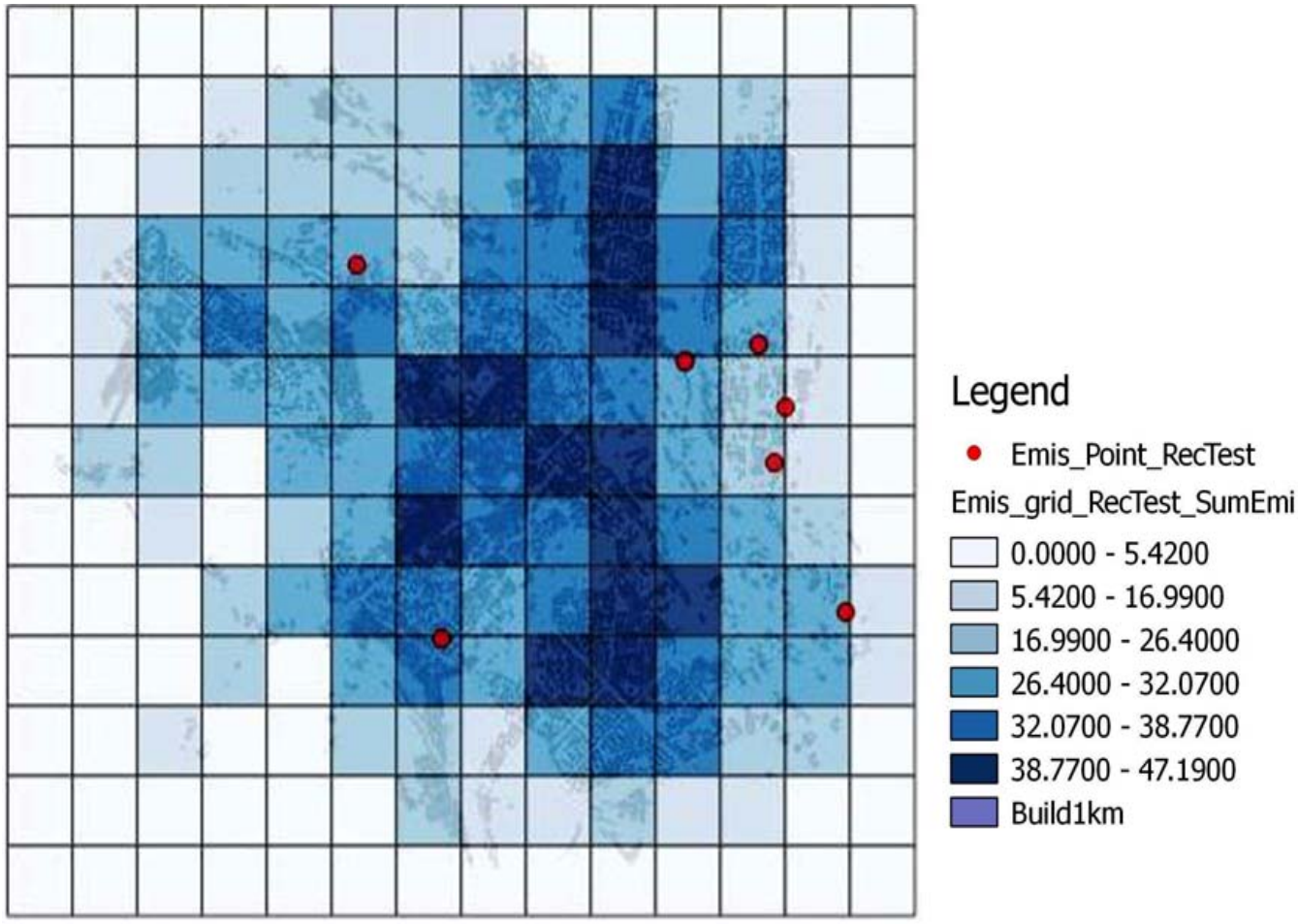
	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O
1		**Statistical summary Averages**													
2					Units:	µg/m³	µg/m³	µg/m³	µg/m³	µg/m³	µg/m³	µg/m³	µg/m³		
3						NOx	NO2	O3	SO2	CO	TSP	PM10	PM2.5		
4					Min	10,3	7,0	32,0	4,8	185,7	16,3	15,5	15,1		
5					Max	70,1	40,8	58,0	34,4	687,2	20,8	19,4	18,5		
6					Average	36,5	23,3	45,0	18,9	427,1	18,3	17,2	16,6		
7					CountRec	182	182	182	182	182	182	182	182		
8															
9															
10		**Statistical summary Emissions**													
11															
12		**Total (Transport + Area + Point // without emission scaling)**													
13			X	Y		NOx	SO2	CO	TSP	PM10	PM2.5				
14	Units:		m	m		tons/year	tons/year	tons/year	tons/year	tons/year	tons/year				
15	Sum					17200,2	3675,5	140582,8	1239,9	1109,6	974,1				
16	Min		632500	5202500		0	0	0	0	0	0				
17	Max		645500	5214500		542,9	192,0	812,3	13,7	9,8	9,6				
18	Average														
19	CountCells														
20															
21		**Transport**	X	Y		NOx	SO2	CO	TSP	PM10	PM2.5	PM exhaust	TSP nonexh	PM10 nonexh	PM2.5 nonexh
22	Units:		m	m		tons/year	tons/year	tons/year	tons/year	tons/year	tons/year	tons/year	tons/year	tons/year	tons/year
23	Sum					15158,1	1786,6	138023,6	1004,8	890,4	771,7	644,7	360,2	245,7	127,0
24	Min		632500	5202500		0	0	0	0	0	0	0	0	0	0
25	Max		645500	5214500		154,0	15,2	812,3	11,1	9,5	7,9	6,2	4,9	3,3	1,7
26	Average		639612,2	5208698		15,1	1,8	137,1	1,0	0,9	0,8	0,6	0,5	0,4	0,2
27	CountCells		1007	1007		1007	1007	1007	1007	1007	1007	1007	695	695	695
28															
29		**Area**	X	Y		NOx	SO2	CO	TSP	PM10	PM2.5				
30	Sum					1104,2	1482,4	1934,4	205,5	194,1	179,9				
31	Min		632500	5202500		5,3E-05	9,82E-06	3,35E-05	8,63E-07	7,95E-07	7,49E-07				
32	Max		645500	5214500		13,3	13,8	16,2	2,0	1,8	1,7				
33	Average		639536	5208687		4,0	5,3	7,0	0,7	0,7	0,6				
34	CountCells		278	278		278	278	278	278	278	278				
35															
36		**Point**	X	Y	Stack height	NOx	SO2	CO	TSP	PM10	PM2.5				
37	Sum					937,8	406,5	624,8	29,6	25,1	22,5				
38	Min				50	6,88416	0,06	0	0	0	0				
39	Max				150	542,9	192,0	419,9	13,7	9,8	9,6				
40	Average		642331,8	5209065	104,4444	104,2	45,2	69,4	3,3	2,8	2,5				
41	CountCells		9	9	9	9	9	9	9	9	9				
42															

RunModels | Rec_eval | Hourly_Conc | Average_Conc | ConcStatistics | Moldova_Transport | Moldova_Area

Spatial distribution of average annual NO_x emissions, tons



Spatial distribution of average annual SO_x emissions , tons



2. Operational Street Pollution model (OSPM)

Modelled street: Calea Iesilor

The nearest monitoring station: nr. 3

Length of the section, m: 2900

Width of the section, m: 24

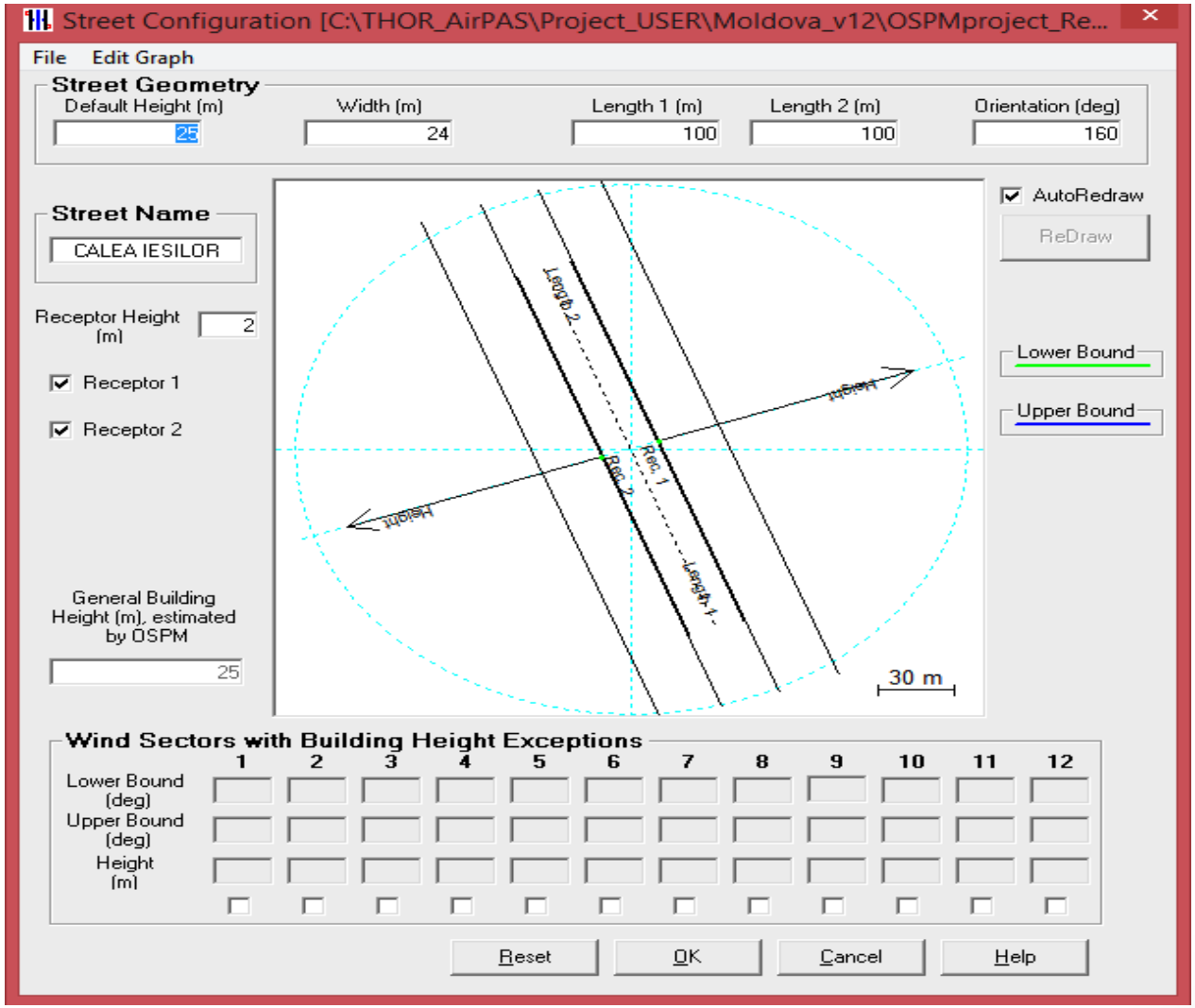
Height of the building, m: 6-45

Traffic speed, km/h: 10-50

Average Daily Traffic, vehicles/per day/: 30000

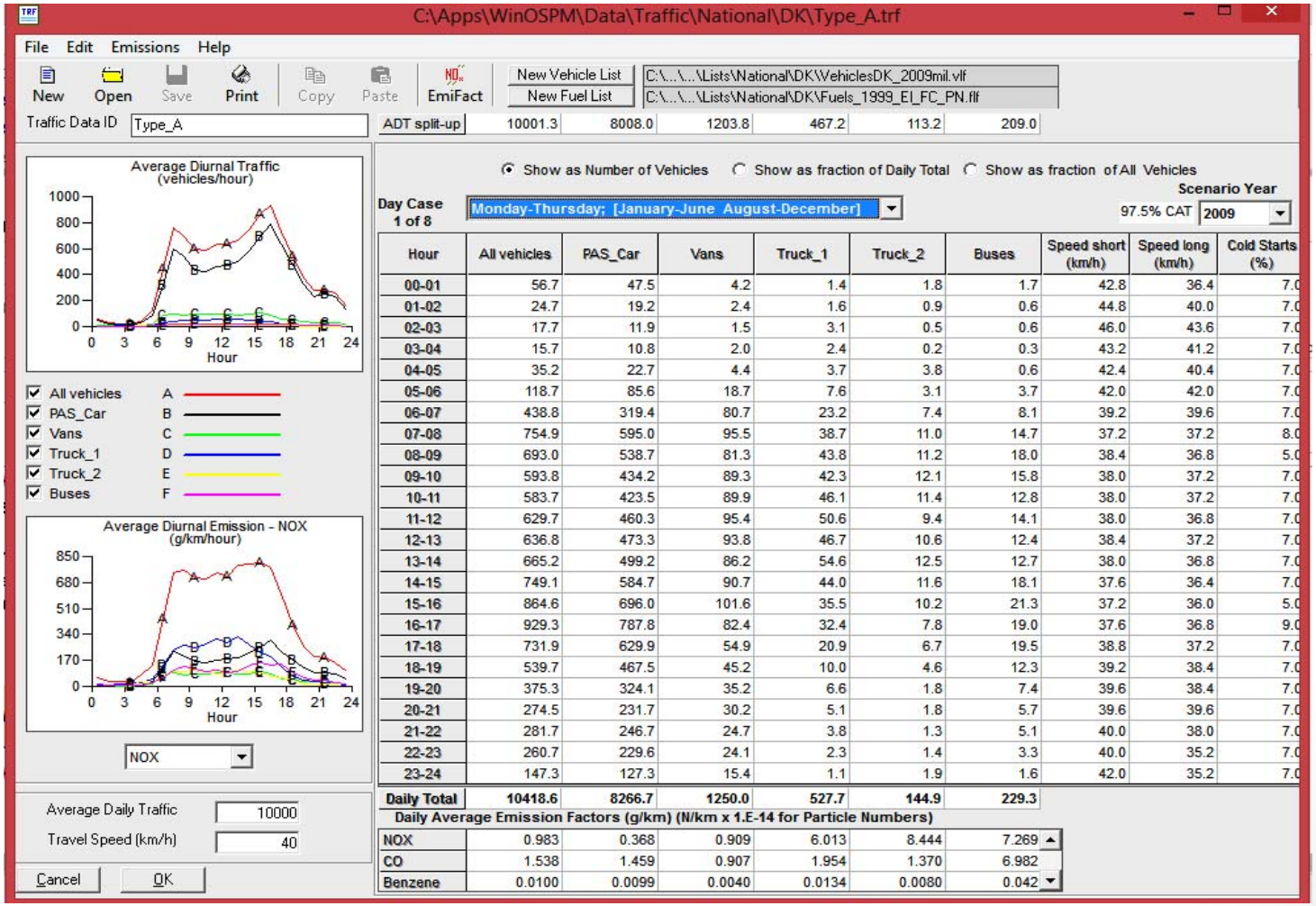
The “Street Configuration” window (Calea Iesilor str.),

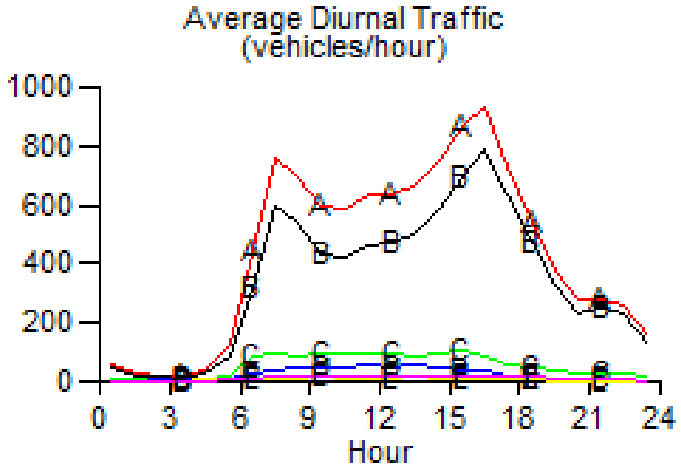
showing the information in the graphical interface of WinOSPM software

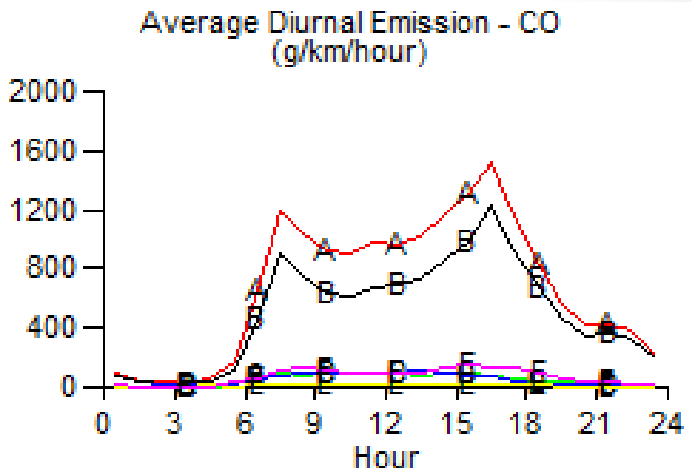


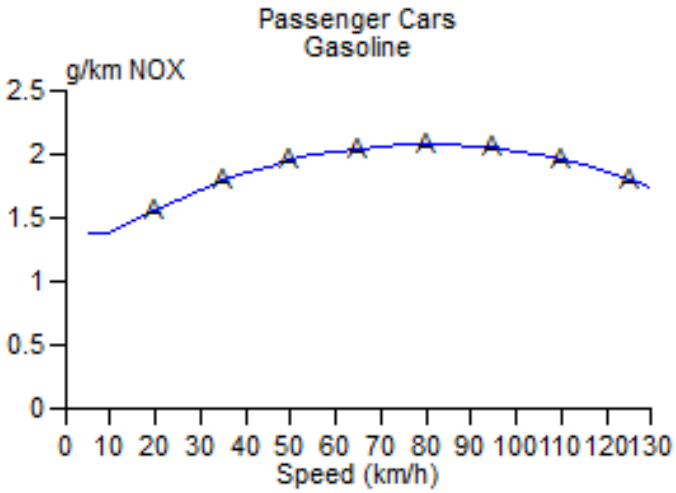
The traffic window for Chisinau mun.

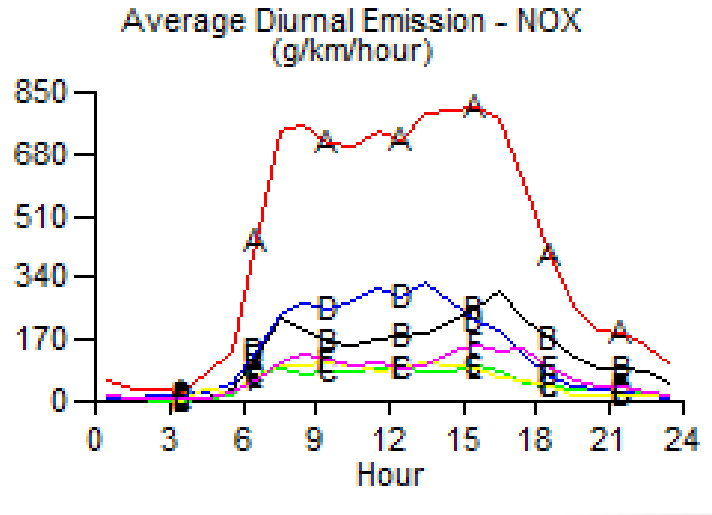
with example of ADT split into various vehicle classes





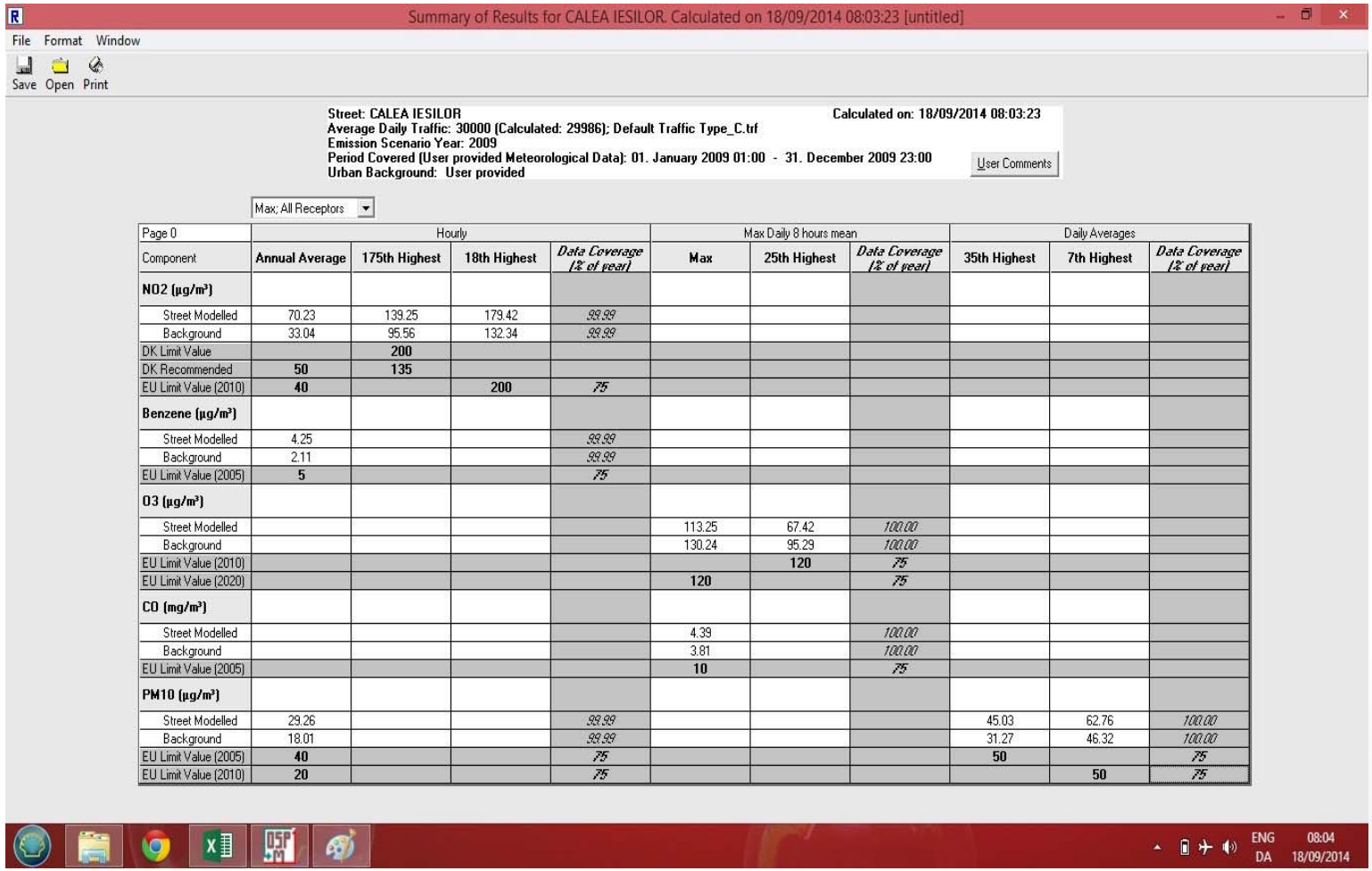






Vehicle Emission Factors, Passenger Cars, 2009

The “Result” window summarizes the results compared to limit values for the Calea Iesilor str.



Summary of Results for CALEA IESILOR. Calculated on 18/09/2014 08:03:23 [untitled]

File Format Window

Save Open Print

Street: CALEA IESILOR
Calculated on: 18/09/2014 08:03:23
Average Daily Traffic: 30000 (Calculated: 29986); Default Traffic Type_C.trf
Emission Scenario Year: 2009
Period Covered (User provided Meteorological Data): 01. January 2009 01:00 - 31. December 2009 23:00
Urban Background: User provided
User Comments

Max; All Receptors

Page 0	Hourly				Max Daily 8 hours mean			Daily Averages		
Component	Annual Average	175th Highest	18th Highest	Data Coverage (% of year)	Max	25th Highest	Data Coverage (% of year)	35th Highest	7th Highest	Data Coverage (% of year)
NO2 (µg/m³)										
Street Modelled	70.23	139.25	179.42	99.99						
Background	33.04	95.56	132.34	99.99						
DK Limit Value		200								
DK Recommended	50	135								
EU Limit Value (2010)	40		200	75						
Benzene (µg/m³)										
Street Modelled	4.25			99.99						
Background	2.11			99.99						
EU Limit Value (2005)	5			75						
O3 (µg/m³)										
Street Modelled					113.25	67.42	100.00			
Background					130.24	95.29	100.00			
EU Limit Value (2010)						120	75			
EU Limit Value (2020)					120		75			
CO (mg/m³)										
Street Modelled					4.39		100.00			
Background					3.81		100.00			
EU Limit Value (2005)					10		75			
PM10 (µg/m³)										
Street Modelled	29.26			99.99				45.03	62.76	100.00
Background	18.01			99.99				31.27	46.32	100.00
EU Limit Value (2005)	40			75				50		75
EU Limit Value (2010)	20			75					50	75

ENG DA 08:04 18/09/2014

Conclusions:

Results:

- Generated background concentration for a city;
- Generated street concentrations for selected street (Calea Iesilor) in the city and compared with air quality limit values;
- Provided geographic distribution of emissions and concentrations.

Advantages of the THOR-AirPAS utilization:

- The front-end graphical interface to the system is easy to use (interact with input data, air quality models and output data);
- The system is fully automated.

Disadvantages of the THOR-AirPAS utilization

- Will be established in the process of utilization.

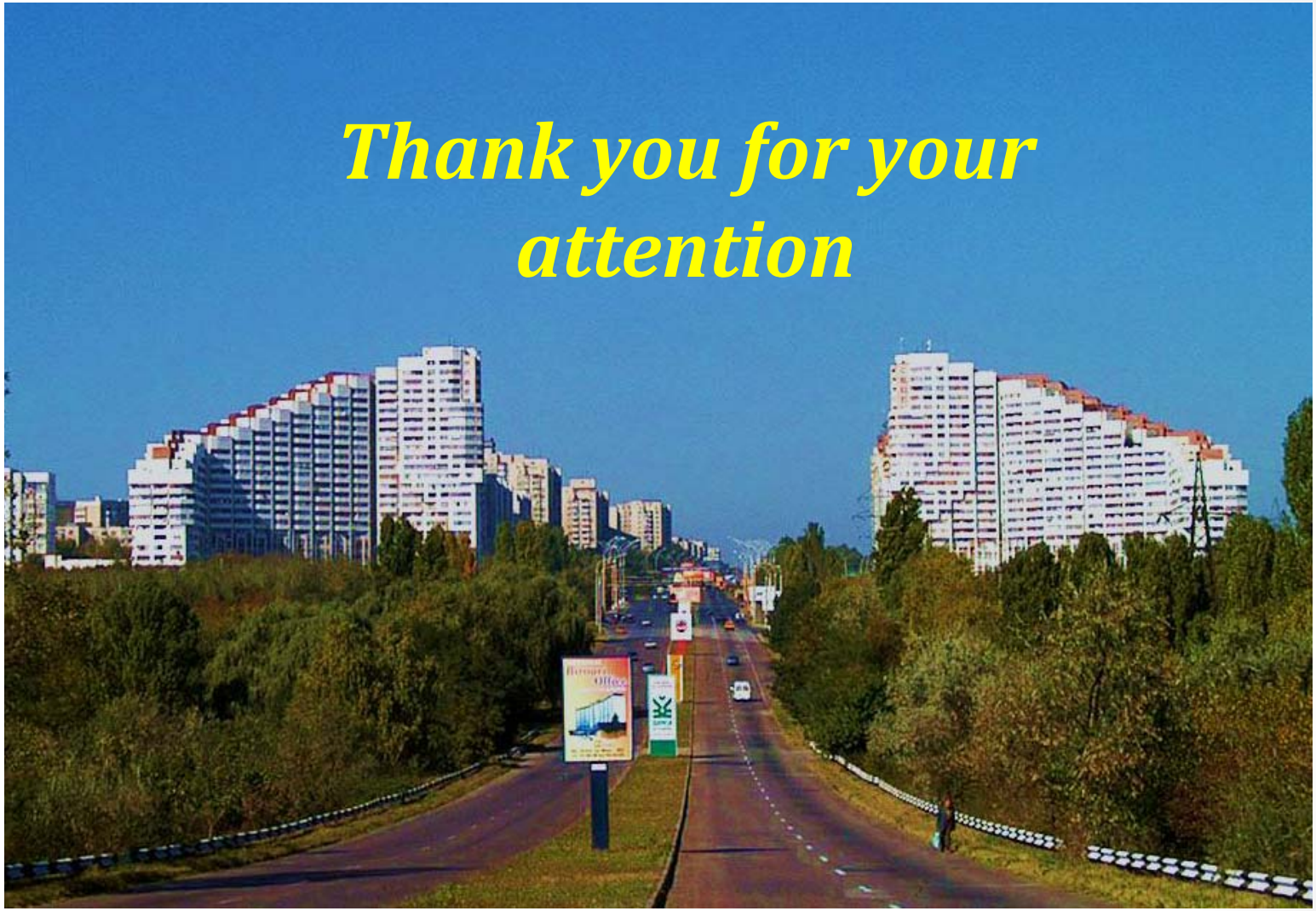
Future plans with the THOR-AirPAS system

According to **Directive 2008/50/EC** of the European Parliament and of the Council of 21 May 2008 on ambient air quality and cleaner air for Europe, p.6:
"Where possible modelling techniques should be applied to enable point data to be interpreted in terms of geographical distribution of concentration. This could serve as a basis for calculating the collective exposure of the population living in the area".

That is why:
Ministry of Environment should take a decision on the THOR-AirPAS (Air Pollution Assessment System) application in the R.Moldova.

For that it is necessary to:

- Establish institution / department which will be responsible for air quality modeling;
- Train specialists expected to operate the system in the future;
- Ensure availability of funds and for the THOR-AirPAS system maintenance services.


Thank you for your attention