Corso di Vulnerabilità dei Sistemi Urbani

Prof. R. Fistola

The Global Urban Risk Understanding (GURU)

Paper presented to AESOP International Conference - Naples

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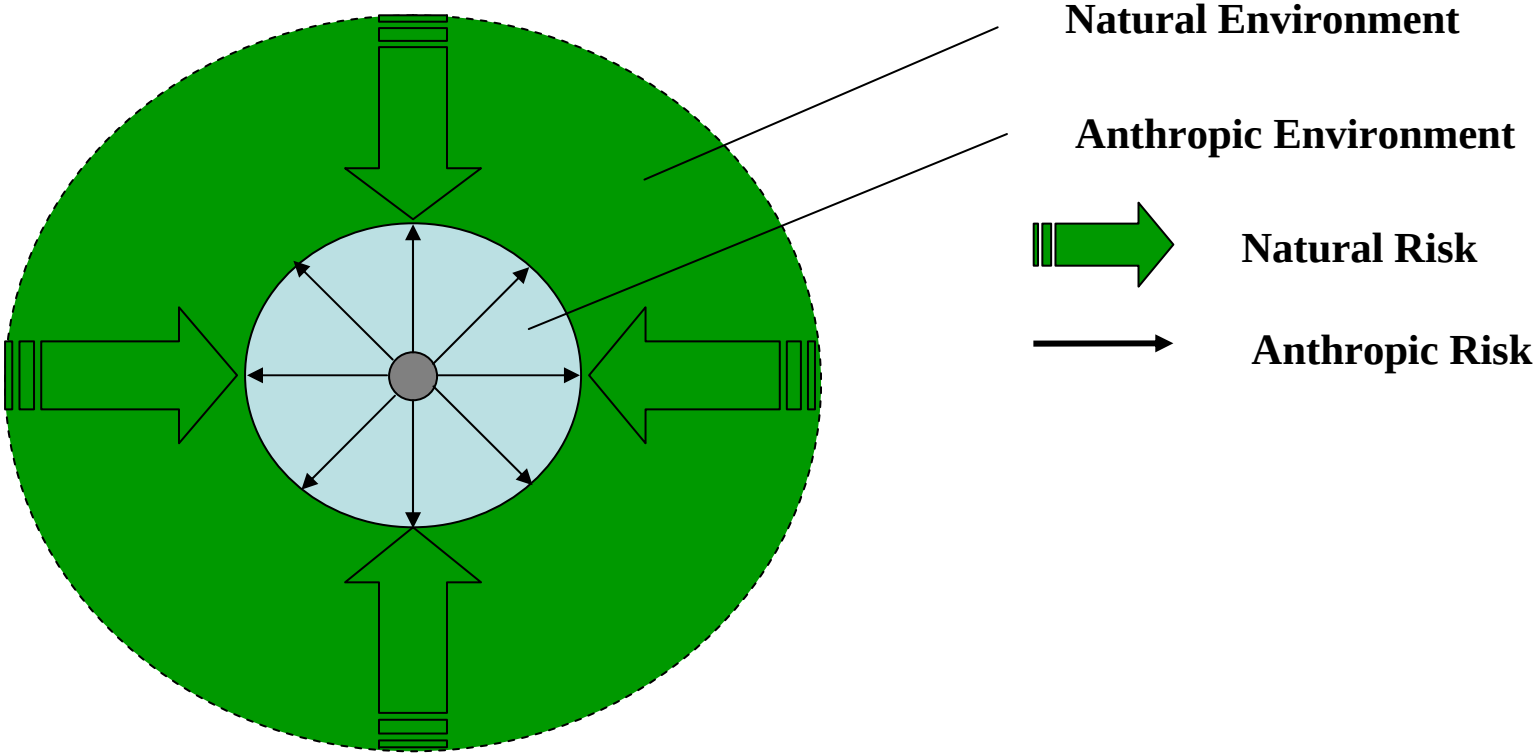
Topics

1. Components of urban risk
2. Natural Hazard
3. Anthropic Hazard
4. The Global Urban Risk
5. GURU a non analytical way to evaluate urban risk
6. Ten italian cities
7. Urban subsystems and variables
8. the URTO scheme
9. A statistical confutation
10. conclusions

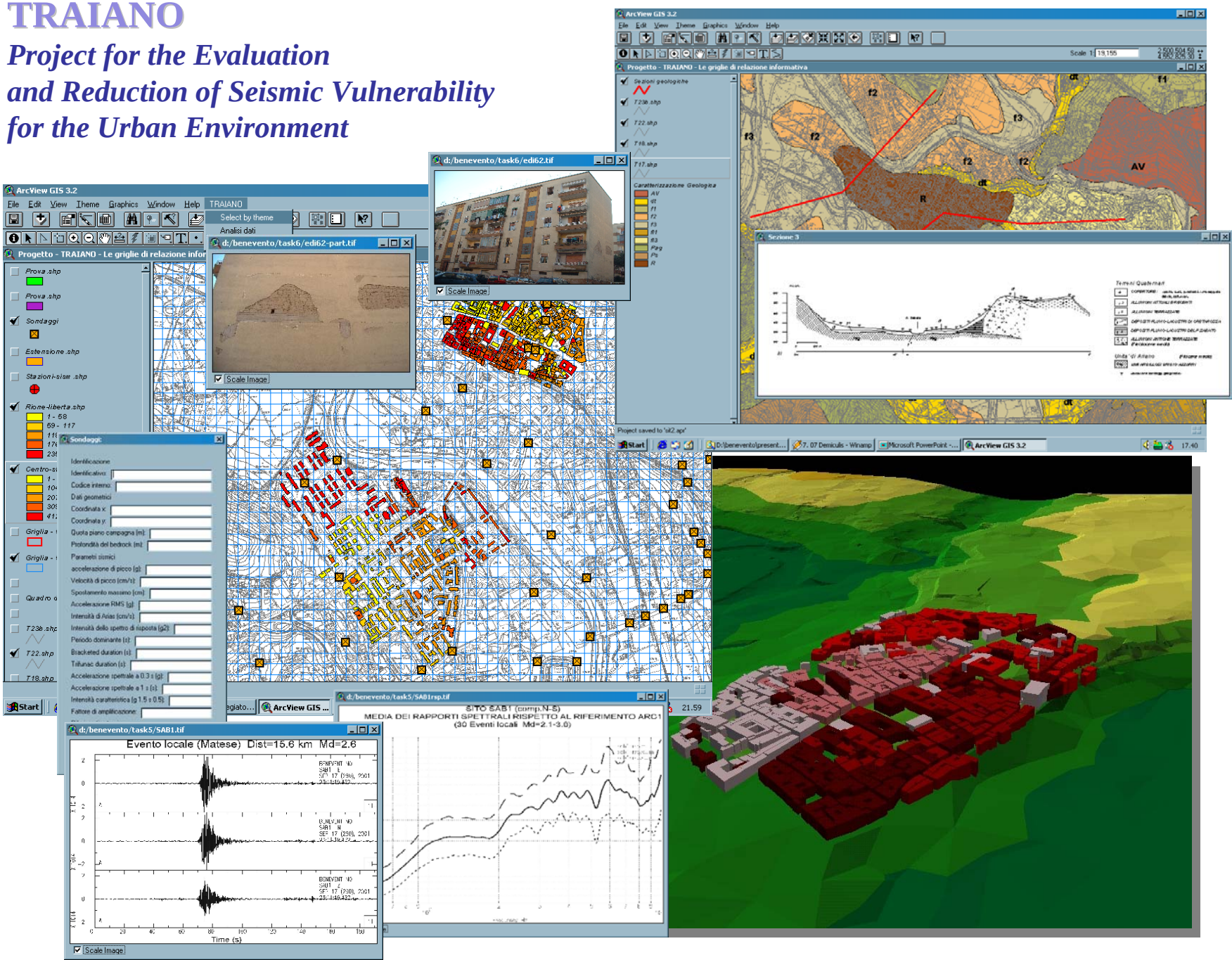
Global Urban Risk

hazards wich impact on natural and anthropic environment



TRAIANO

Project for the Evaluation and Reduction of Seismic Vulnerability for the Urban Environment



The Global Urban Risk Understanding (GURU)

Romano Fistola – Rosa Anna La Rocca

AESOP 2007
NAPOLI - 11/14 JULY
esop

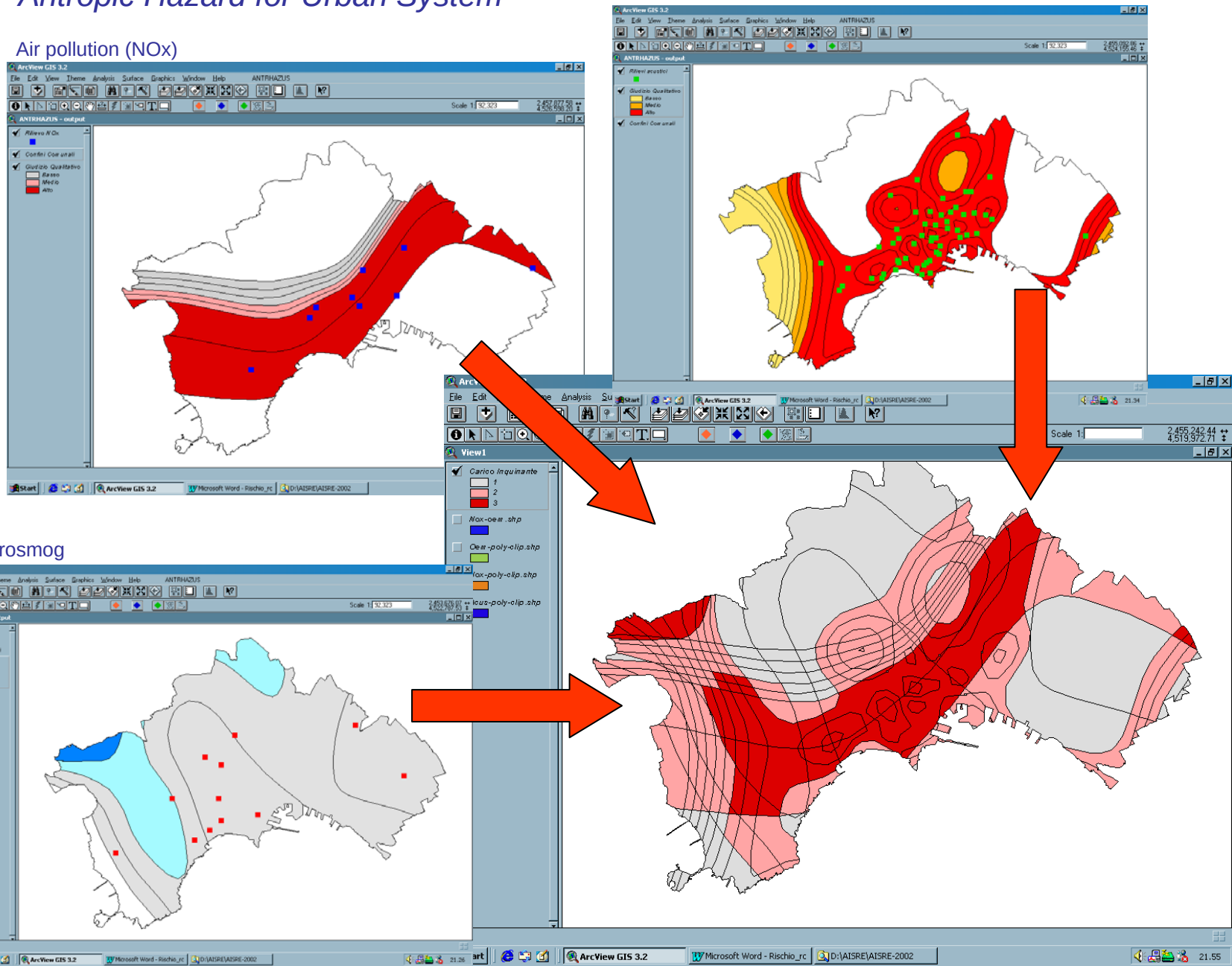
ANTHRAZUS

Antropic Hazard for Urban System

Air pollution (NOx)

acoustic

electrosmog



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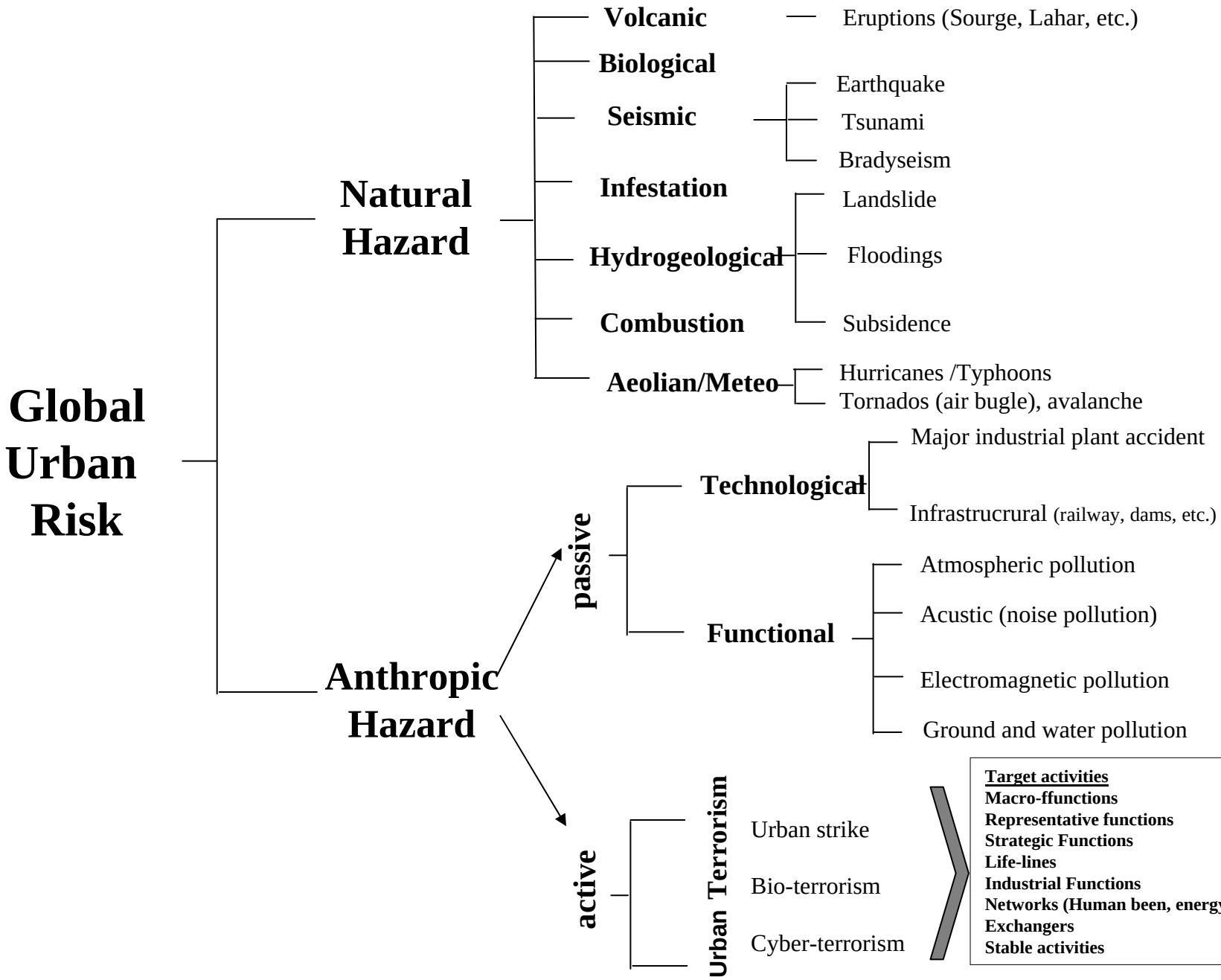
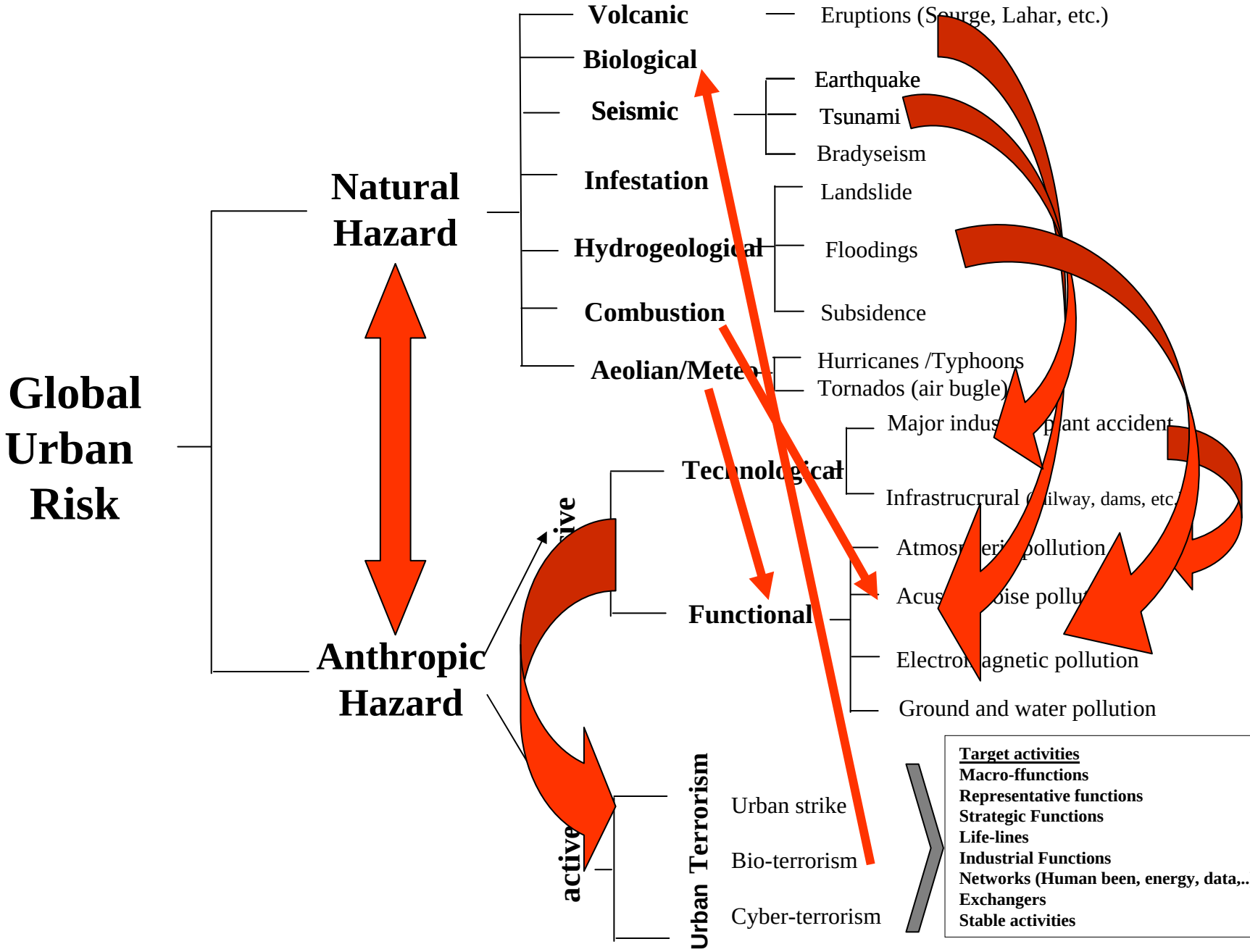

Global Urban Risk
Natural Hazard
Volcanic
Eruptions (Sourge, Lahar, etc.)
Biological
Seismic
Earthquake
Tsunami
Bradyseism
Infestation
Hydrogeological
Landslide
Floodings
Subsidence
Combustion
Aeolian/Meteo
Hurricanes /Typhoons
Tornados (air bugle), avalanche
Anthropic Hazard
passive
Technological
Major industrial plant accident
Infrastrucrural (railway, dams, etc.)
Functional
Atmospheric pollution
Acustic (noise pollution)
Electromagnetic pollution
Ground and water pollution
active
Urban Terrorism
Urban strike
Bio-terrorism
Cyber-terrorism
Target activities
Macro-ffunctions
Representative functions
Strategic Functions
Life-lines
Industrial Functions
Networks (Human been, energy, data,..)
Exchangers
Stable activities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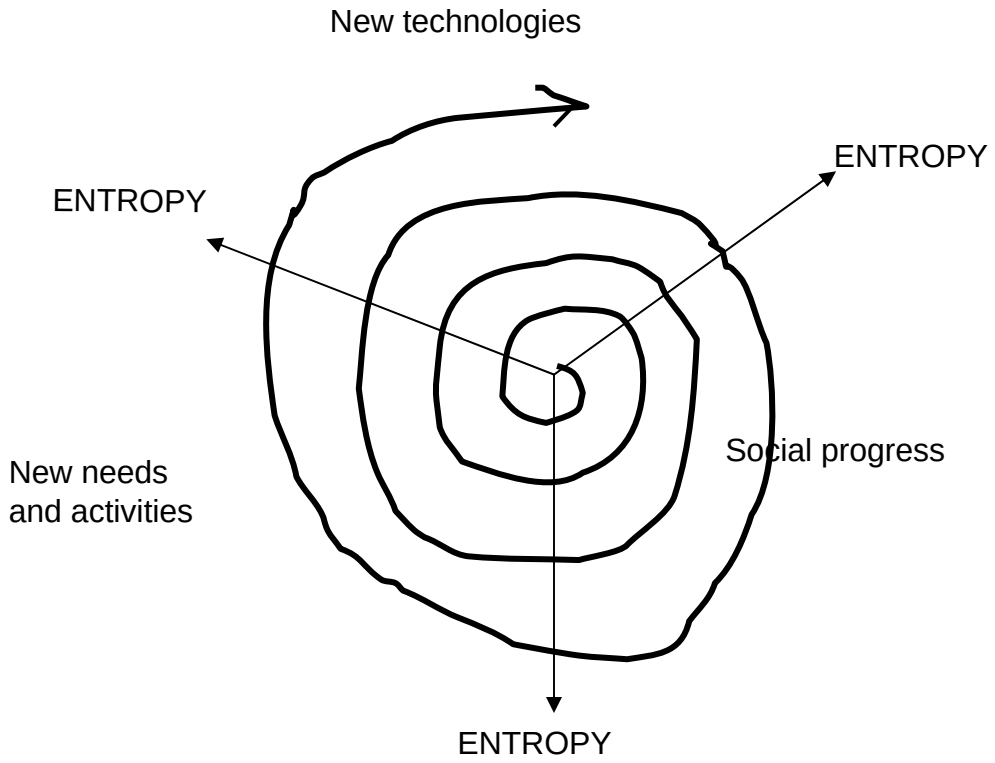
tecnology/enthropy



Lean and green?

is it possible to find a non-analytical (and fast) way
in order to describe the global urban risk level of a city?

The Global Urban Risk Understanding
(GURU)

Analytical settlement Vs Knoledgement evaluation

Quantitative Vs Qualitative

Data Vs Expertise

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Analytical settlement Vs Knoledgement evaluation

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STATISTICS **DELPHI**

The variables
(subdivided into four urban subsystems)

Physical Subsystem	*Functional Subsystem*	*Socio-anthropical Subsystem*	*Geomorphological Subsystem*
1.age of buildings; 2. main structural features; 3.maintenance care carried out by residents; 4.buildings decay; 5.exposure to industrial risk; 6.public transport facilities; 7.compact urban form; 8.Presence of urban empty space.	1.population density; 2.population concentration 3.vulnerable urban functions; 4.strategic urban functions; 5.presence of industrial risk; 6.tourism charge; 7.urban macrofunctions; 8.vehicular traffic; 9.commuting.	1.management of pollution air; 2.pollution air levels; 3.waste production per inhabitants 4.unemployment rate; 5.crowding rate; 6.meta-ethnicity; 7.population increase.	1.altitude; 2.presence of rivers; 3.seaboard; 4.presence of underground caves; 5.presence of volcano; 6.seismism 7.hydrogeology; 8.territorial scale; 9.urbanization level.

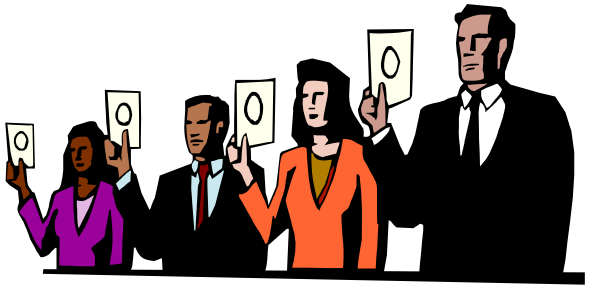
The micro Delphi for ten italian cities

Regional capital cities with a population exceeding 100.000 inhabitants;

High level of urbanization (density>500 inhab/sqkm);

Presence of natural and anthropic risk factors on urban territory.

Delphi results
(risk evaluation for each variable)



	V1	V2	V3	V4	V5	V6	V7	V8
Bari	MEDIUM	HIGH	LOW	MEDIUM	MEDIUM	LOW	HIGH	LOW
Bologna	HIGH	HIGH	MEDIUM	LOW	MEDIUM	MEDIUM	HIGH	LOW
Firenze	HIGH	HIGH	LOW	LOW	HIGH	LOW	HIGH	MEDIUM
Genoa	HIGH	HIGH	MEDIUM	MEDIUM	HIGH	LOW	HIGH	MEDIUM
Milan	HIGH	LOW	HIGH	MEDIUM	HIGH	HIGH	HIGH	MEDIUM
Napoli	HIGH	LOW	HIGH	HIGH	HIGH	MEDIUM	HIGH	MEDIUM
Palermo	MEDIUM	LOW	MEDIUM	HIGH	MEDIUM	MEDIUM	HIGH	MEDIUM
Roma	HIGH	LOW	HIGH	MEDIUM	HIGH	MEDIUM	HIGH	MEDIUM
Torino	HIGH	LOW	MEDIUM	MEDIUM	HIGH	LOW	HIGH	HIGH
Venezia	HIGH	HIGH	LOW	LOW	MEDIUM	LOW	HIGH	HIGH

Physical subsystem

From qualitative to quantitative

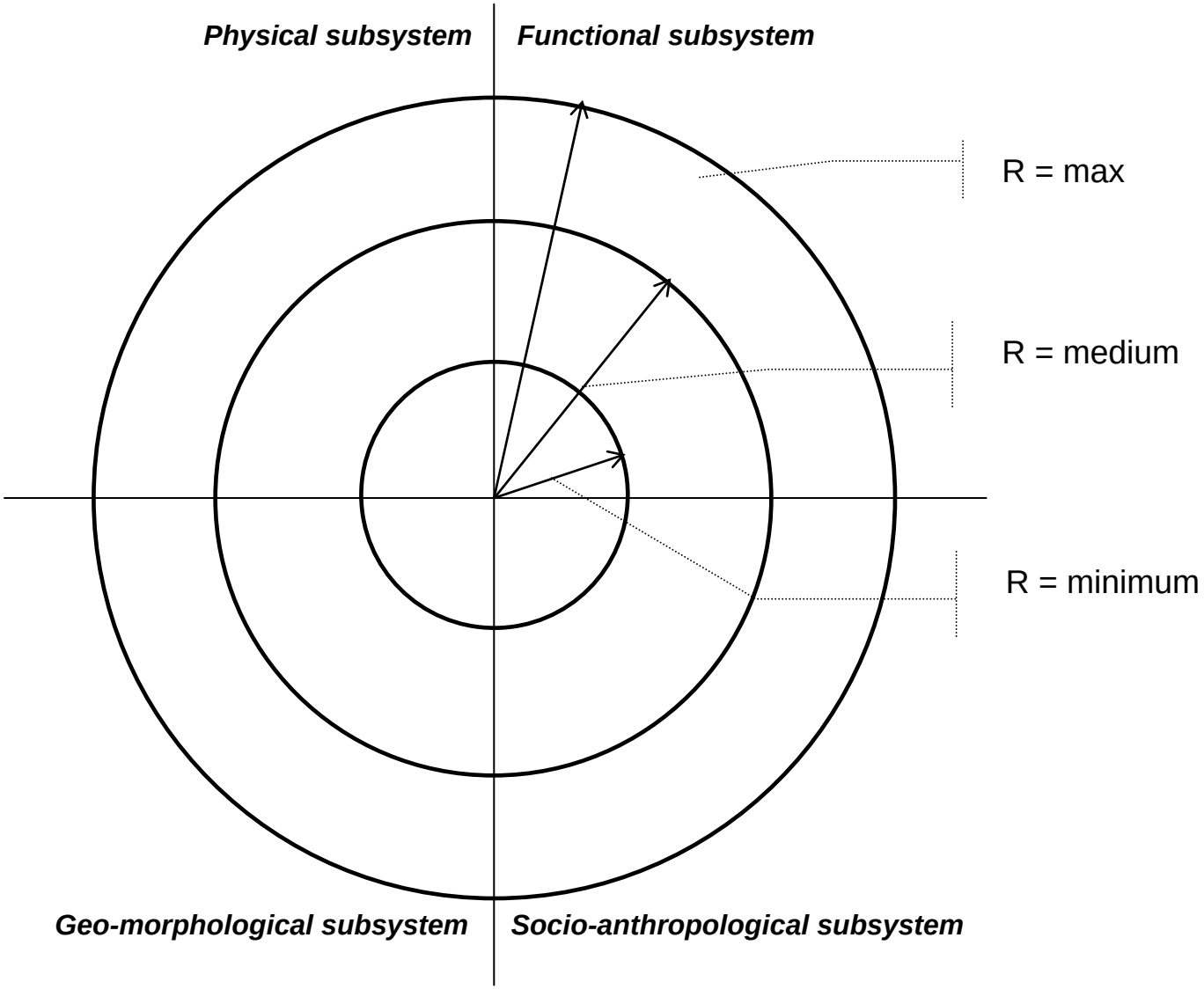
conversion table

LOW	0 ÷ 0,2
MEDIUM	0,3 ÷ 0,5
HIGH	0,5 ÷ 1,0

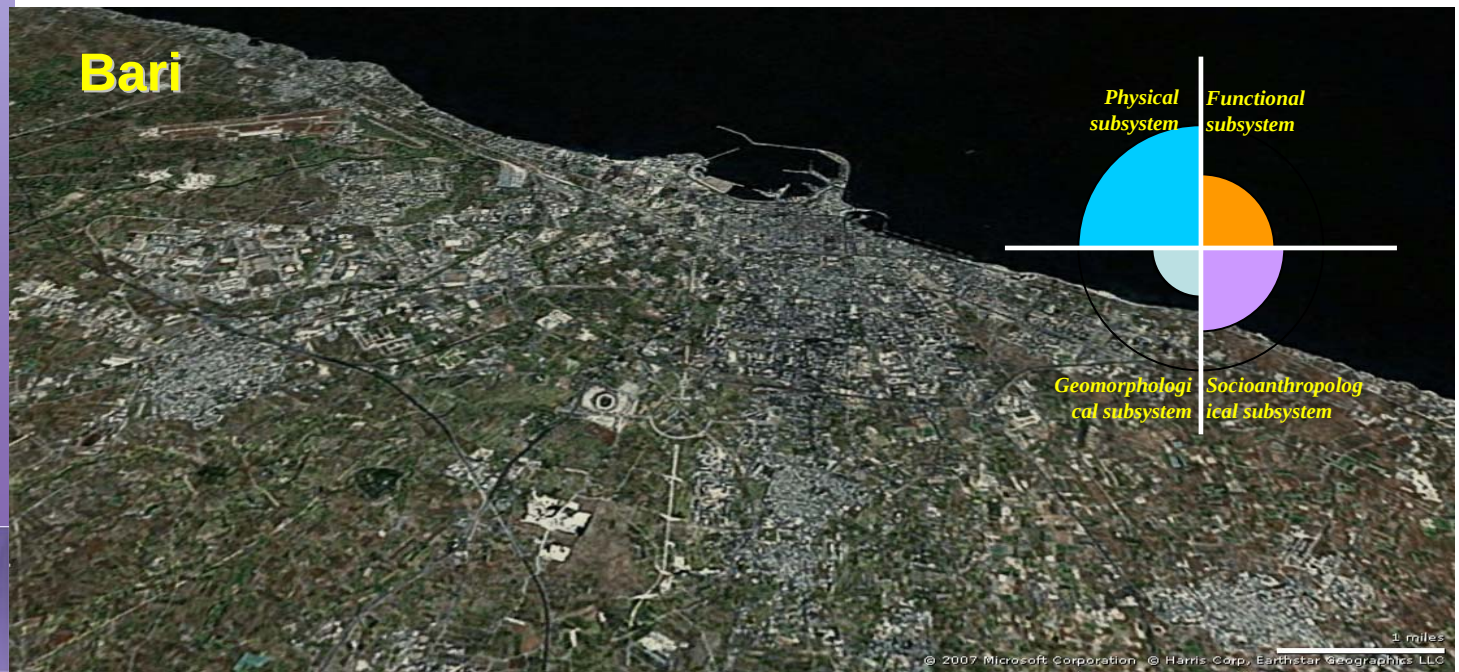
system indicator values

	sottosistema fisico	***sottosistema funzionale***	***sottosistema socioantropico***	***sottosistema geomorfologico***
Bari	0,44	0,56	0,64	0,39
Bologna	0,56	0,61	0,57	0,33
Firenze	0,56	0,72	0,71	0,33
Genova	0,69	0,56	0,64	0,56
Milano	0,75	0,78	0,71	0,50
Napoli	0,75	0,94	0,64	0,67
Palermo	0,56	0,61	0,50	0,44
Roma	1,25	0,89	0,50	0,56
Torino	0,63	0,61	0,64	0,56
Venezia	0,56	0,44	0,43	0,39

The **URTO** scheme
(Urban Risk Target Oriented)



The URTO scheme



GURU confutation
(back to statistics)

Statistics: physical subsystem

variables		*Bari*	*Bologna*	*Firenze*	*Genova*	*Milano*	*Napoli*	*Palermo*	*Roma*	*Torino*	*Venezia*
1	*%ANTE_45*	18	29	44	43	31	36	19	17	29	35
	%POST_45	65	62	48	52	62	55	59	68	63	56
2	*STRUTT_PREV* *	1	1	1	1	2	2	2	2	2	1
3	*INTERV_ABIT*	110832	173388	155474	272146	583335	964635	232853	1015995	391895	114863
	%_INTER_STR	3,96	7,28	7,62	4,55	5,29	5,64	4,09	3,07	4,54	8,57
	SENS_MANU	0,55	0,58	0,62	0,63	0,55	0,47	0,51	0,57	0,58	0,63
4	*%PESSIMO*	3,73	1,54	1,07	3,00	2,33	8,67	6,58	2,61	2,24	1,88
5	*UL_RISK*	3	12	11	9	3	10	2	12	4	21
	UL_RISK_CL	2	5	3	0	3	1	1	12	10	5
6	*METRO*	5	37	0	5,5	76	23	39	38	9,6	0
7	*COMP_URB*	953,80	1232,06	1518,15	1117,18	3203,91	2867,62	1465,59	790,47	3010,64	278,45
8	*VER_ATTR*	1,5	9,9	5,4	1,3	3,9	0,2	0,6	1,9	3,7	5
	PARC_URB	0,1	10	4,6	38,9	3,2	1,9	14,6	6,6	6,9	2,1
	ARR_URB	1	3,6	0,9	0,3	2,2	0,5	0,3	1,3	0,8	1,3

* 1= breast wall; 2 = reinforced concrete; 3 = other

Statistics : functional subsystem

variables		*Bari*	*Bologna*	*Firenze*	*Genova*	*Milano*	*Napoli*	*Palermo*	*Roma*	*Torino*	*Venezia*
1	**PopRes_05**	326.915	373.743	366.901	620.316	5	984.242	670.820	7	900.608	269.780
	DENS_05	2813,4	2655,7	3582,7	2546,5	7188,1	8393,0	4222,2	1982,2	6918,7	653,9
2	**P_CE_AB**	314523	368512	351358	605144	1254135	1002783	683651	2509970	863933	256928
	P_NU_AB	260	249	251	1545	519	118	664	8189	549	5538
	P_CA_SPA	1749	2456	4509	3618	1557	1599	2407	28645	781	8607
3	**SCUOLE**	200	156	194	304	433	694	465	1193	350	160
	UNIVERSIT	3	1	3	1	8	5	1	15	2	2
	SANIT	17	16	17	13	35	40	26	116	26	7
4	**UL_DIF_NAZ**	26	12	27	6	23	37	28	148	25	15
	UL_SI_OP	13	12	10	21	15	31	6	50	23	11
	UL_VVFF	7	5	3	8	7	15	2	20	5	7
5	**INDU_RISK**	3	12	11	9	3	10	2	12	4	21
	IND_RISK_CL	2	5	3	0	3	1	1	12	10	5
6	**PRESS_TUR**	246	56	777	298	335	625	437	961	452	579
7	**UNIVERSIT**	3	1	3	1	8	5	1	15	2	2
	SANIT	17	16	17	13	35	40	26	116	26	7
8	**VEIC_TOT**	224482	282078	291314	442735	955570	685109	503651	2356566	691330	148162
	% AUTO	79	73	70	65	77	78	76	78	81	78
	% MOTO	11	16	19	26	12	14	16	12	8	10
	% A_M	90	89	89	91	89	92	92	91	89	89
9	**PENDOL**	138448	179999	167732	273780	630556	385957	292916	1274847	421357	125952

Statistics : socio-anthropological subsystem

varibles		*Bari*	*Bologna*	*Firenze*	*Genova*	*Milano*	*Napoli*	*Palermo*	*Roma*	*Torino*	*Venezia*
1	**QUALARIA**	5,2	4,3	7,8	8,6	5,5	7,7	4,4	0,9	5,4	2,7
2	**TA_TUMO**	251,84	401,14	384,89	407,20	378,16	256,53	237,70	278,02	339,57	418,11
	TA_RESP	69,06	93,36	94,32	79,40	80,78	53,85	47,77	51,66	77,85	55,50
3	**RIF_URB**	593,7	585,3	717,9	526,7	557,5	591,6	623,1	n.d.	601,1	726
	RIF_URB_D	10,2	19,1	26,3	11,3	30,3	5,2	9,3	n.d.	22,6	21,4
4	**T_DISOCC**	18,97	4,38	5,58	8,6	5,5	31,39	29,4	11,08	8,44	5,15
	DISOCC_GIO	53,49	14,79	19,83	28,83	20,58	74,93	70,81	40,1	27,16	16,59
5	**IND_AFF**	3	2	2	2	2	3	3	3	2	2
6	**POP_STRA_R**	6474	25385	30163	28630	143125	14741	14193	145004	69312	13008
	IND_STRA	2,05	6,84	8,47	4,69	11,39	1,47	2,07	5,69	8,01	4,80
7	**VAR_01_05**	3,2	0,7	2,9	1,6	4,0	-2,1	-2,4	0,0	3,9	-0,5

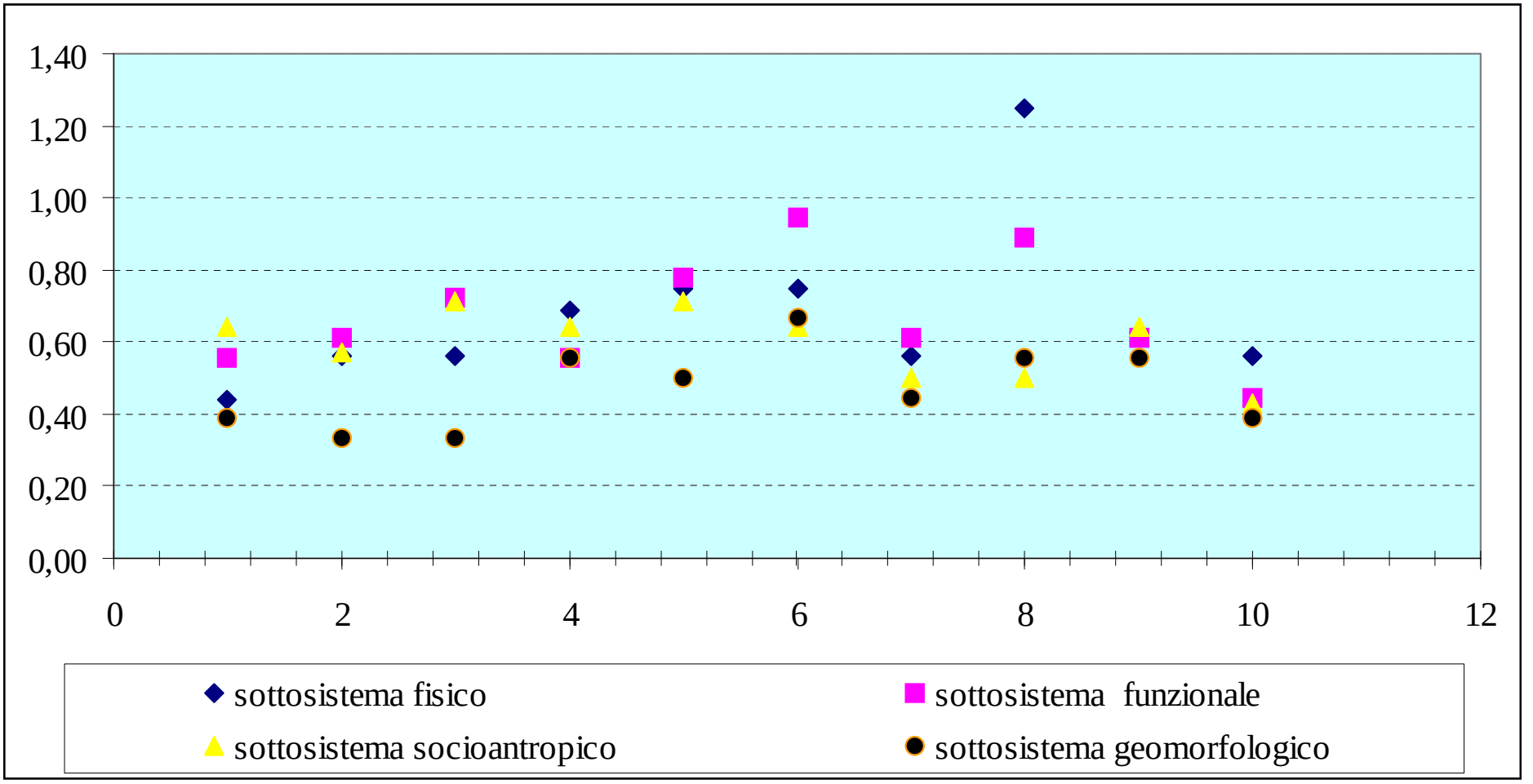
Statistics : geo-morphological subsystem

variables		*Bari*	*Bologna*	*Firenze*	*Genova*	*Milano*	*Napoli*	*Palermo*	*Roma*	*Torino*	*Venezia*
1 / 3	**ZONA ALTIM ***	5	3	3	2	5	4	5	5	5	5
2	**FIUMI ****	0	0	1	0	1	0	0	1	1	0
4	**CAVIT****	0	0	0	0	0	1	0	1	0	0
5	**VULC****	0	0	0	0	0	1	1	0	0	0
6	**GRA_SISM**	3	3	2	4	4	2	2	3	4	4
7	**IDROGEO**	3	3	2	4	4	4	2	2	4	1
8	**SUP_TER**	116,2	140,73	102,41	243,6	182,07	117,27	158,88	1285,3	130,17	412,54
9	**GRA_URB**	3	3	3	3	3	3	3	3	3	3

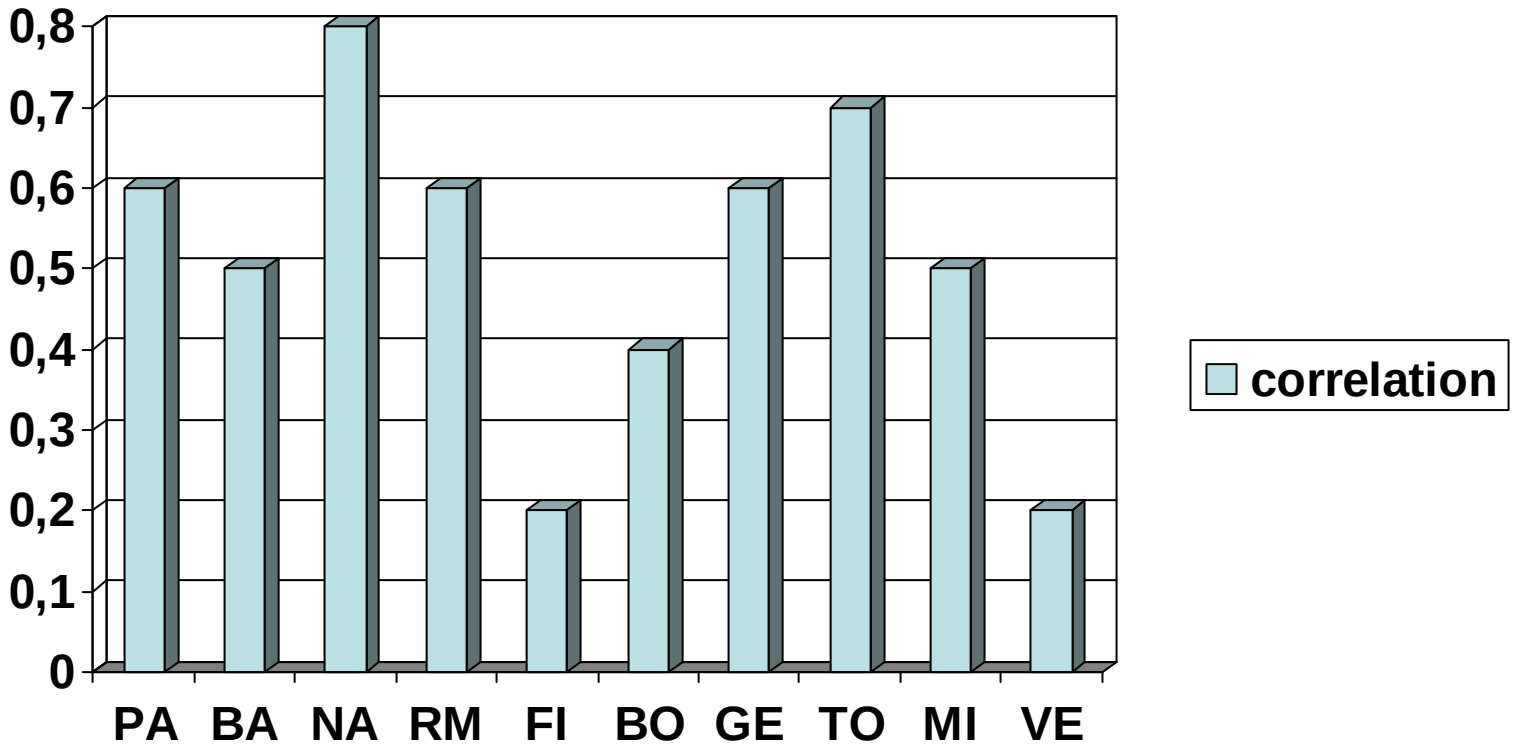
* 2 = coastal mountain; 3 = internal hill; 4 = coastal hill; 5 = plain.

** 0 = NO; 1 = YES

Variables dispersion



Correlation between Delphi and statistic evaluations



CONCLUSIONS

- The global urban risk it's a complex field of study
- It could be useful to find a non analytical way to evaluate the risk
- The GURU could represent a first attemp
- It's possible to develop a "joint procedure"
- A fast evaluation of the GUR could be usefull in order to set up town planning actions
- GURU could be usefull to understand which urban subsystem is more vulnerable inside the city