



FLASH FLOODS AND PLUVIAL FLOODING



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REGIONE AUTONOMA
DELLA SARDEGNA



MINISTERO DELL'AMBIENTE
E DELLA TUTELA DEL TERRITORIO E DEL MARE

Working Group F Thematic Workshop

Flood maps information content for insurance and re-
insurance industries



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Italy*

26th-28th May 2010, Cagliari, Italy



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SIGRA

A Flood Insurance Risk Management Integrated System

Presentation adapted from the official project documentation owner ANIA

(Telespazio and AGRICUNSLTING)

Object - to develop a nation-wide integrated system to assess and manage insurance and re-insurance aspects of the flood risk



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- ✓ Develops flood scenarios simulation at the national scale taking into account temporal and spatial correlation among flood-prone sites
- ✓ Combines hazard and vulnerability information through probabilistic algorithms to develop a complete portfolio flood risk assessment
- ✓ Provides a direct evaluation of insurance-specific parameters for any portfolio with confidence limits
- ✓ Web-GIS platform with high resolution geo-coding SW
- ✓ Advanced visualization features



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- Identifies hierarchy of rivers segments with regards to the potential risk
- Includes and manages relevant official territorial data, including high resolution satellite data
- Includes remotely sensed surveys from laser scanner techniques for quasi-2D and 2D flood simulations
- Completes the official information where needed and computes flood forcing products (e.g. flow depth) where not available
- Data are homogenized, validated and corrected for the entire nation



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Project step

Study Areas Identification

Reference Data base implementation

**Existing Hazard maps Collection &
Analysis**

Ex-Novo Hazard maps production

Scenarios Simulation

**Insurance/re-insurance risk parameters
evaluation**



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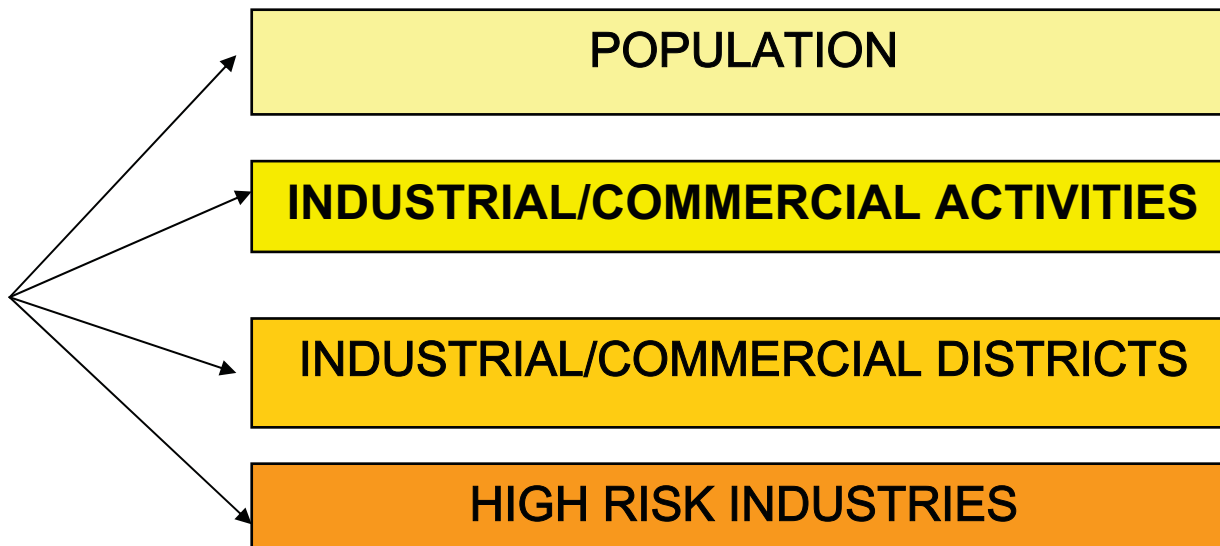


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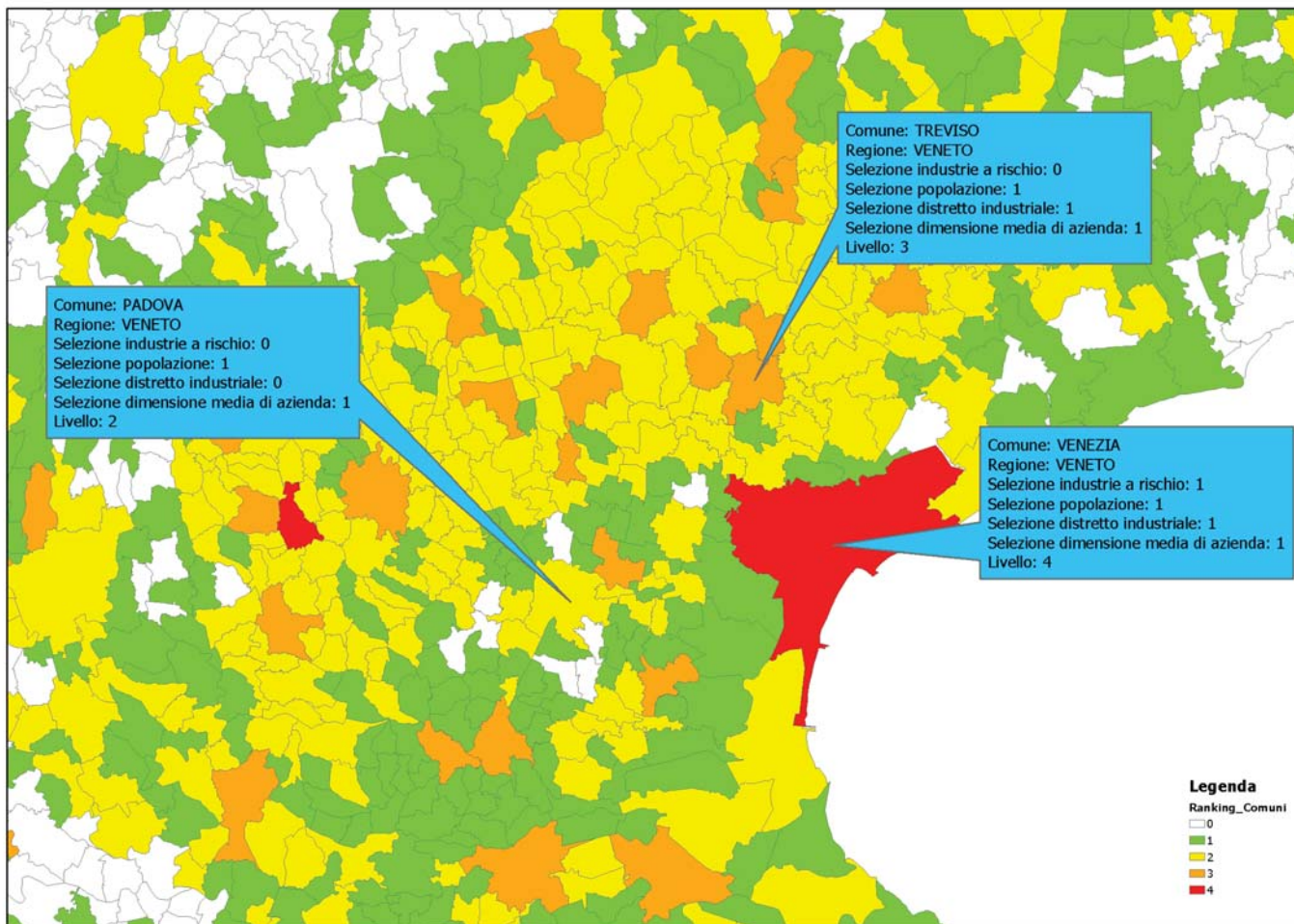
RANKING



CLASSIFICATION



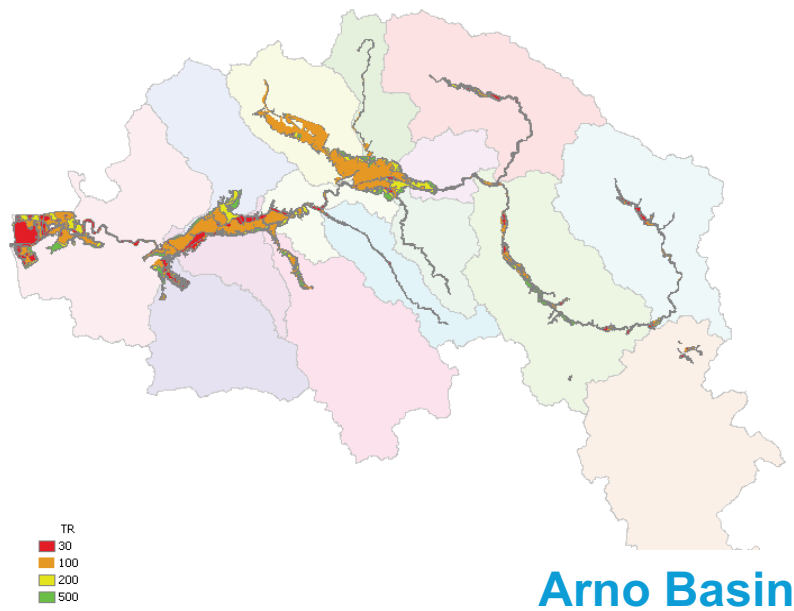
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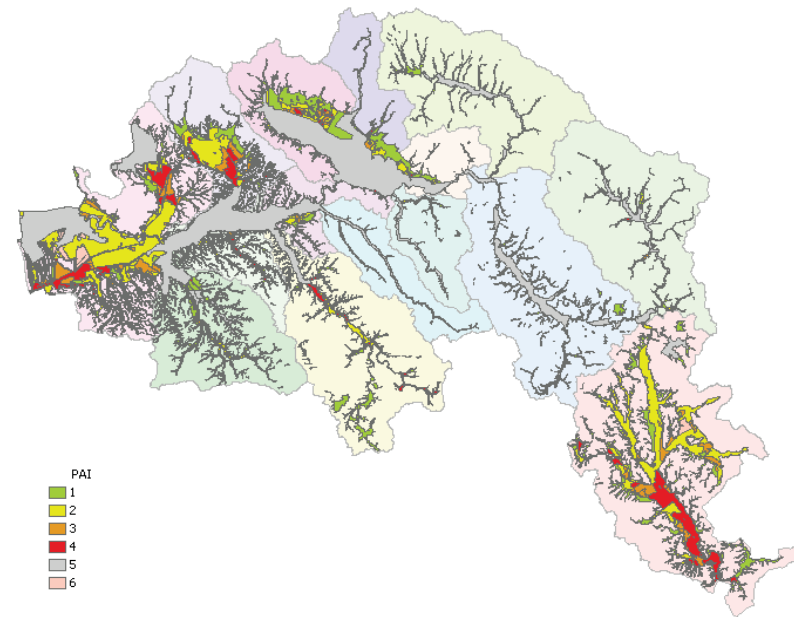
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Modeled flood prone areas



Historically flooded areas

HYDROLOGIC MODELING

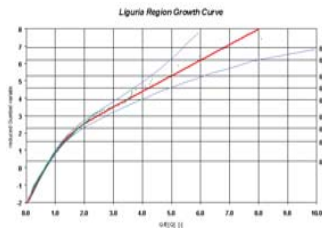
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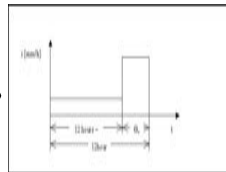


HYDROLOGIC MODELING

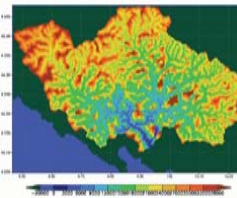
Rainfall growth curve (VAPI)



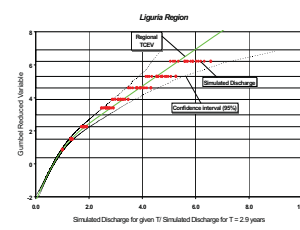
Design ietograph



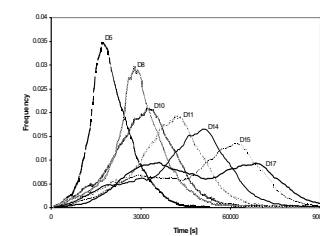
Semi-distributed R/R model



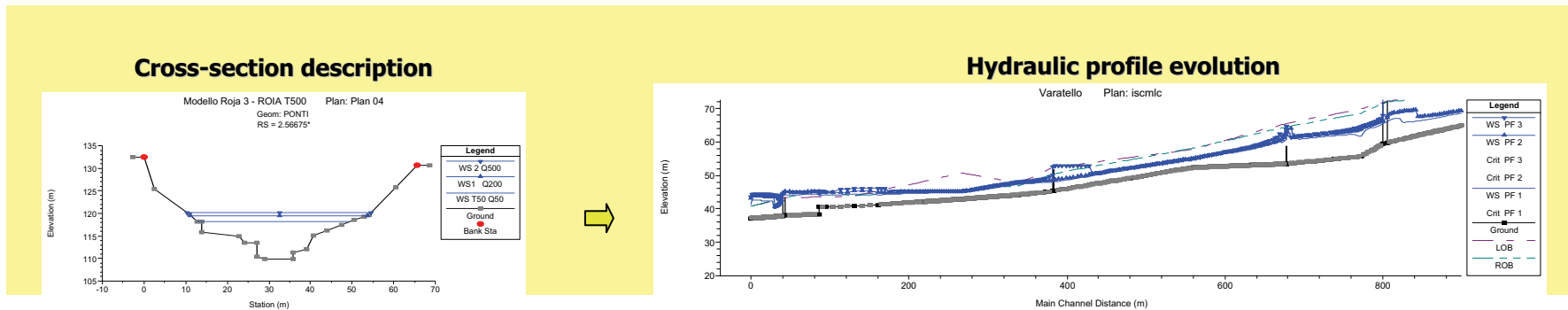
Discharge growth curve



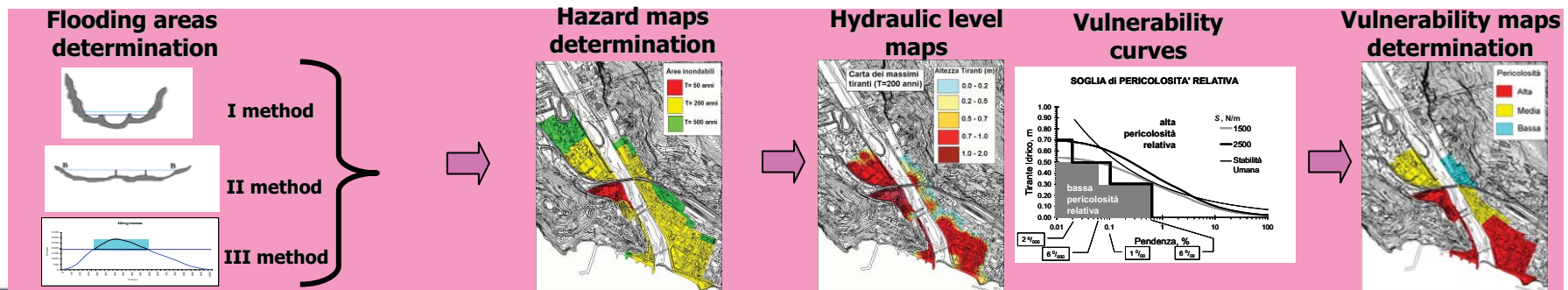
Hydrograph with assigned return period



HYDRAULIC MODELING



HAZARD MAPPING

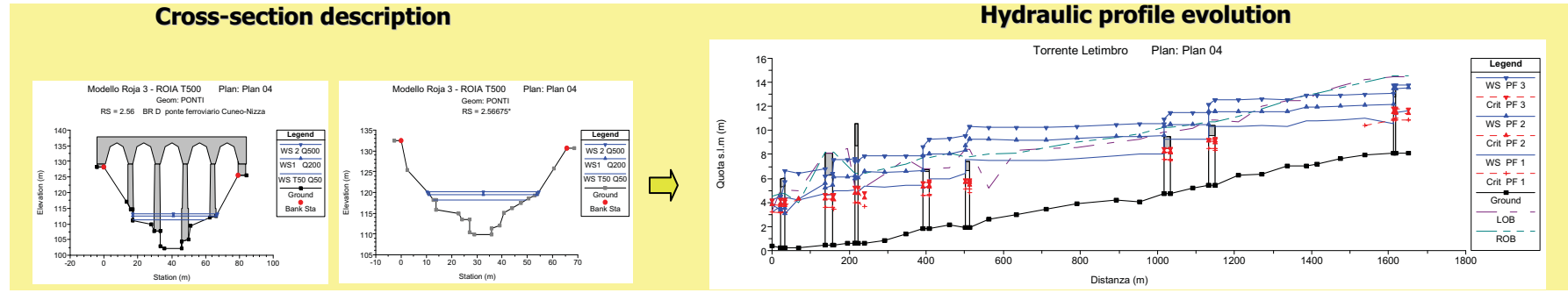




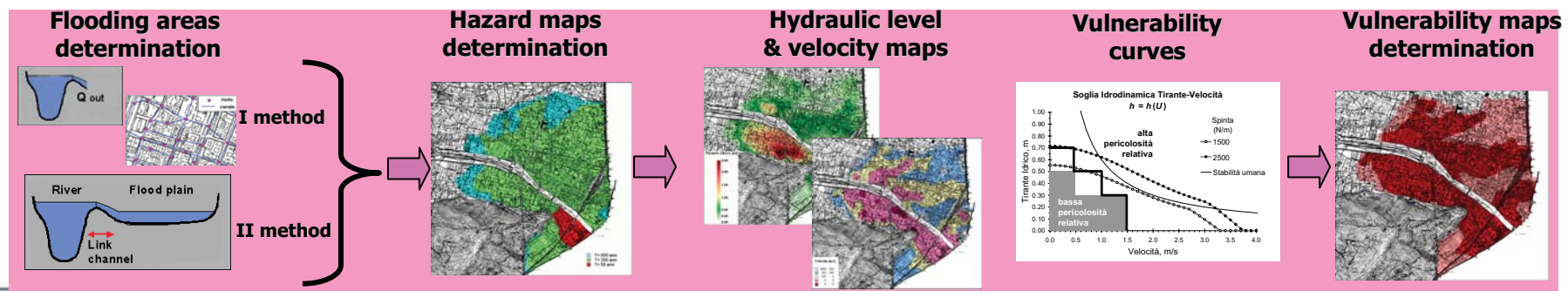
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HYDRAULIC MODELING

Urban Scale



HAZARD MAPPING

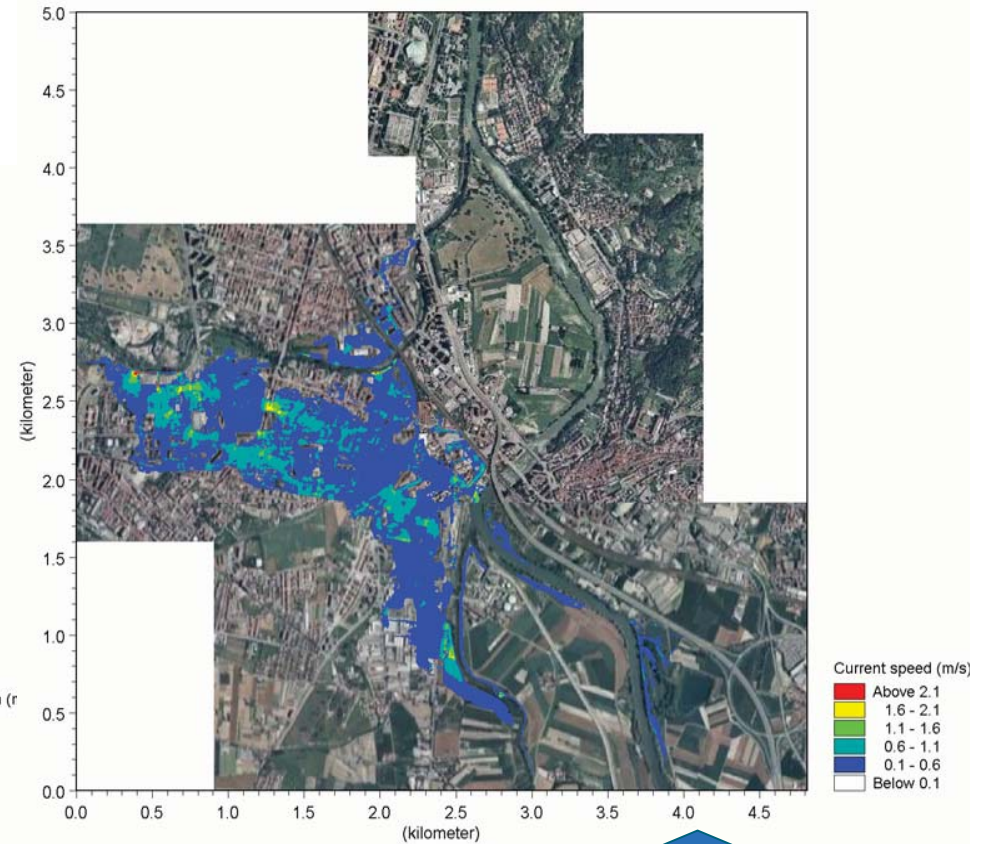
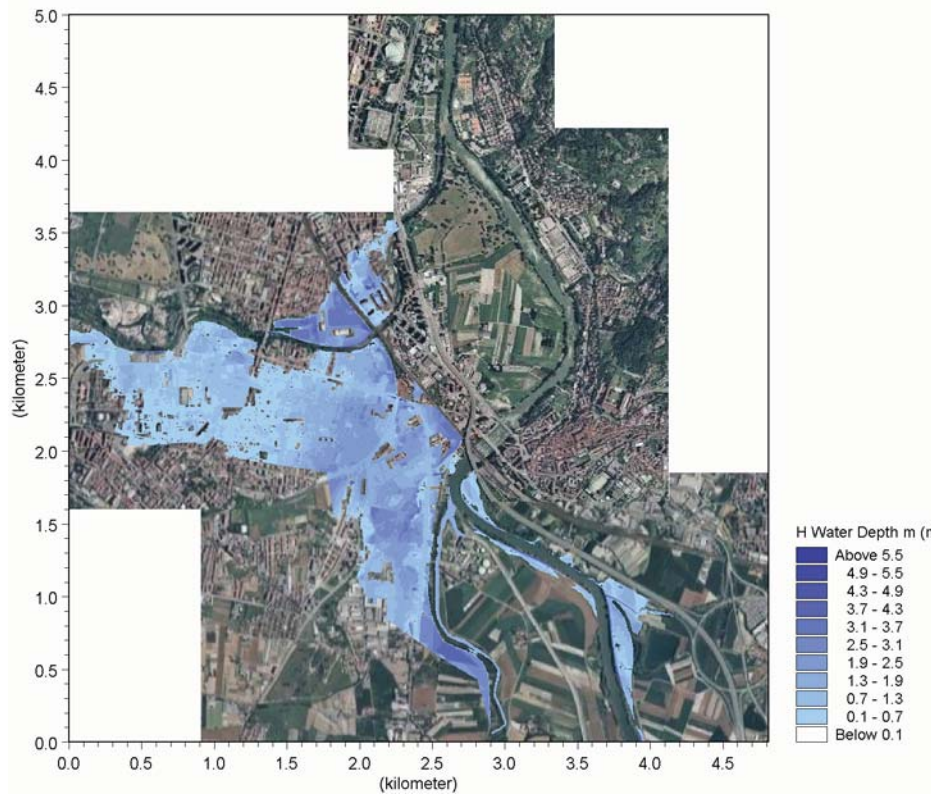




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Depth of water



Velocity of water





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Scenarios Simulation

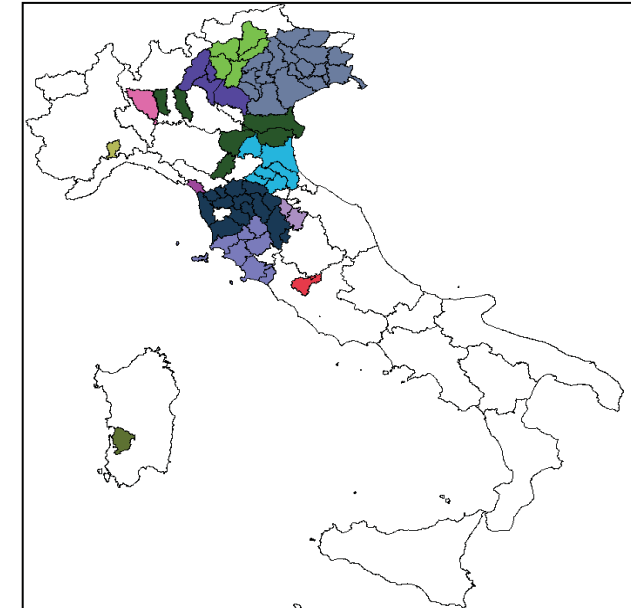
- Reference area. The analysis and the generation of flood events is performed at this scale. The Italian territory is divided in 288 reference areas.
- Event. Single flood described at the reference area scale.
- Scenario. All events within a 168 hours (7 days) duration.
- Historical scenario. A real scenario, observed in the past. Historical scenarios were derived from the AVI catalog.
- Synthetic scenario. A scenario generated through a statistic model, calibrated on the basis of the large scale knowledge provided by the AVI catalog.
- AEL, PML and MPL. Annual Expected Loss, Probable Maximum Loss and Maximum Possible Loss. They are needed to price insurances and to limit the overall risk assumed by a single company.



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AVI, Reference Areas and
Historic Scenarios





Vulnerability Tables

BUILDING

Characteristics:

- Material
- Floor
- Maintenance
- Protections

Classe tirante		Merci				Merci < 5 milioni				Merci > 5 milioni			
		Media	Varianza	σ	Mediana	Media	Varianza	σ	Mediana	Media	Varianza	σ	Mediana
0	19	0,9431869	1,1210178	1,0587813	0,6666667	0,7545495	0,8968143	0,847025	0,5333333	1,1318243	1,3452214	1,2705376	0,8
20	39	7,1587632	101,8754	10,093335	2,5125104	5,7270105	81,500321	8,0746676	2,0100083	8,5905158	122,25048	12,112001	3,0150125
40	59	10,145491	165,62375	12,869489	4,1647059	8,1163929	132,499	10,295591	3,3317647	12,174589	198,7485	15,443387	4,9976471
60	79	22,978759	807,05441	28,408703	10,076187	18,383007	645,64353	22,726962	8,0609497	27,574511	968,46529	34,090444	12,091424
80	99	22,978759	807,05441	28,408703	10,076187	18,383007	645,64353	22,726962	8,0609497	27,574511	968,46529	34,090444	12,091424
Classe tirante		Macchinari				Macchinari < 7,5 milioni				Macchinari > 7,5 milioni			
		Media	Varianza	σ	Mediana	Media	Varianza	σ	Mediana	Media	Varianza	σ	Mediana
0	19	4,8148194	175,47349	13,246644	0,286711	3,8518555	140,3768	10,597313	0,2293688	5,7777833	210,56819	15,895969	0,3440532
20	39	4,1493854	58,368352	7,6399183		3,3195083	46,694681	6,1119346	0,8	4,9792625	70,042022	9,167902	1,2
													8
													7,2217195
													34,275836
Classe tirante		Fabbricati				Fabbricati < 10 milioni				Fabbricati > 10 milioni			
		Media	Varianza	σ	Mediana	Media	Varianza	σ	Mediana	Media	Varianza	σ	Mediana
0	19	1,039	2,9643615	1,7217321	0,4	0,8312	2,3714892	1,3773857	0,32	1,2468	3,5572338	2,0660785	0,48
20	39	2,75016	27,690185	5,2621464	0,45	2,200128	22,152148	4,2097171	0,36	3,300192	33,228222	6,3145757	0,54
40	59	4,30737	33,690188	5,8043249	1,6	3,445896	26,95215	4,6434599	1,28	5,168844	40,428226	6,9651899	1,92
60	79	4,76	17,300695	4,1594104	4	3,808	13,840556	3,3275284	3,2	5,712	20,760834	4,9912925	4,8
80	99	4,76	17,300695	4,1594104	4	3,808	13,840556	3,3275284	3,2	5,712	20,760834	4,9912925	4,8
100	119	14,64	163,1657	12,773633	12,2	11,712	130,53256	10,218906	9,76	17,568	195,79884	15,32836	14,64
120	139	14,64	163,1657	12,773633	12,2	11,712	130,53256	10,218906	9,76	17,568	195,79884	15,32836	14,64
140	159	35,49	524,98697	22,912594	25,66	28,392	419,98958	18,330075	20,528	42,588	629,98436	27,495113	30,792
160	179	35,49	524,98697	22,912594	25,66	28,392	419,98958	18,330075	20,528	42,588	629,98436	27,495113	30,792
180	199	35,49	524,98697	22,912594	25,66	28,392	419,98958	18,330075	20,528	42,588	629,98436	27,495113	30,792
200	219	35,49	524,98697	22,912594	25,66	28,392	419,98958	18,330075	20,528	42,588	629,98436	27,495113	30,792
220	239	35,49	524,98697	22,912594	25,66	28,392	419,98958	18,330075	20,528	42,588	629,98436	27,495113	30,792
240	259	35,49	524,98697	22,912594	25,66	28,392	419,98958	18,330075	20,528	42,588	629,98436	27,495113	30,792
260	279	35,49	524,98697	22,912594	25,66	28,392	419,98958	18,330075	20,528	42,588	629,98436	27,495113	30,792
280	299	35,49	524,98697	22,912594	25,66	28,392	419,98958	18,330075	20,528	42,588	629,98436	27,495113	30,792
300	319	35,49	524,98697	22,912594	25,66	28,392	419,98958	18,330075	20,528	42,588	629,98436	27,495113	30,792
320	339	35,49	524,98697	22,912594	25,66	28,392	419,98958	18,330075	20,528	42,588	629,98436	27,495113	30,792
340	359	35,49	524,98697	22,912594	25,66	28,392	419,98958	18,330075	20,528	42,588	629,98436	27,495113	30,792
360	379	35,49	524,98697	22,912594	25,66	28,392	419,98958	18,330075	20,528	42,588	629,98436	27,495113	30,792
380	399	35,49	524,98697	22,912594	25,66	28,392	419,98958	18,330075	20,528	42,588	629,98436	27,495113	30,792
400	419	35,49	524,98697	22,912594	25,66	28,392	419,98958	18,330075	20,528	42,588	629,98436	27,495113	30,792
420	439	35,49	524,98697	22,912594	25,66	28,392	419,98958	18,330075	20,528	42,588	629,98436	27,495113	30,792
440	459	35,49	524,98697	22,912594	25,66	28,392	419,98958	18,330075	20,528	42,588	629,98436	27,495113	30,792
460	479	35,49	524,98697	22,912594	25,66	28,392	419,98958	18,330075	20,528	42,588	629,98436	27,495113	30,792
480	499	35,49	524,98697	22,912594	25,66	28,392	419,98958	18,330075	20,528	42,588	629,98436	27,495113	30,792
500	519	35,49	524,98697	22,912594	25,66	28,392	419,98958	18,330075	20,528	42,588	629,98436	27,495113	30,792
520	539	35,49	524,98697	22,912594	25,66	28,392	419,98958	18,330075	20,528	42,588	629,98436	27,495113	30,792
540	559	35,49	524,98697	22,912594	25,66	28,392	419,98958	18,330075	20,528	42,588	629,98436	27,495113	30,792
560	579	35,49	524,98697	22,912594	25,66	28,392	419,98958	18,330075	20,528	42,588	629,98436	27,495113	30,792
580	599	35,49	524,98697	22,912594	25,66	28,392	419,98958	18,330075	20,528	42,588	629,98436	27,495113	30,792



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The SIGRA database contains:

- a map of flood prone areas. For each location it specify flood return period and flow depth. For a single target, this is enough to evaluate hazard and insurance risk parameters.
- 100.000 synthetic scenarios characterized by a space structure statistically similar to the one provided by the AVI historic catalog;
- the portfolio for which the estimation of insurance related parameters - AEL, PML and MPL - is needed (locations, values and vulnerabilities).



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Through this procedure, the portfolio is excited by the ensemble of synthetic scenarios (providing space coherence). A damage is then associated to each event within each scenario taking into account

- 1) flood maps information at portfolio sites (providing actual hazard),
- 2) the values of the expositions and
- 3) their vulnerability.

The damage series is finally analyzed to give AEL, PML and MPL.



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Elementi a rischio - SIGRA - Microsoft Internet Explorer

Indirizzo: http://10.201.109.10/ozsp2.9/sga/gestione-poi/af/elementi

Cerca anche su elementi non georiferiti

Codice Autorità di Bacino: Tutti

Codice comune ISTAT 2001: []

Estensione geografica: N 5240000.0

O 280000.0 | 1350000.0 E

S 3950000.0

Cerca Azzera Esporta in csv Aggiungi

Tempo ritorno <= 200

Tempo ritorno <= 500

Elementi a Rischio

Tempo ritorno <= 50

Tempo ritorno <= 200

Tempo ritorno <= 500

0 <= h < 50 (cm)

50 <= h < 100 (cm)

100 <= h < 150 (cm)

150 <= h < 200 (cm)

200 <= h < 250 (cm)

250 <= h < 300 (cm)

300 <= h < 350 (cm)

350 <= h < 400 (cm)

h >= 400 (cm)

Limiti amministrativi

Mappe

Mappe

Quickbird

Topografia

azioni impresa numero polizza codice elemento tipo polizza tipo rischio indirizzo cap località provincia somma assicurata

Elementi a rischio - SIGRA - Microsoft Internet Explorer

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S 3950000.0

Cerca Azzera Esporta in csv Aggiungi

Legenda

Elementi a Rischio

Selezionati

Tutti

Elementi a Rischio

Mappe Pericolosità

Tempo ritorno <= 50

Tempo ritorno <= 200

Tempo ritorno <= 500

0 <= h < 50 (cm)

50 <= h < 100 (cm)

100 <= h < 150 (cm)

150 <= h < 200 (cm)

200 <= h < 250 (cm)

250 <= h < 300 (cm)

300 <= h < 350 (cm)

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n. elementi totali	sa (eur)	n. elementi riconosciuti a rischio	sa a rischio (eur)	pml netto (eur)	pml lordo (eur)	ael netto (per mille)	ael lordo (per mille)	mpl netto (eur)
20	36.000.000,00	4	4.000.000,00	400.000,00	500.000,00	0,040	0,050	900.000,00

Categoria di pericolosità	n. elementi selezionati	sa (eur)
A rischio	4	4.000.000,00
Pericolosità minima	6	10.000.000,00
ITm = 1 (rischio stimato alto)	1	2.000.000,00
ITm = 2 (rischio stimato medio)	2	4.000.000,00
ITm = 3 (rischio stimato basso)	6	14.000.000,00
ITm = 4 (rischio stimato minimo)	1	2.000.000,00



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Thanks for your attention

