

## IMRA

# Integrative flood risk governance approach for improvement of risk awareness and increased public participation



### I OBIETTIVO INTERMEDIO

**1.1** Contributo nell'ambito delle competenze dell'Autorità di bacino del Tevere (valutazione e gestione del rischio di alluvioni) alla metodologia IMRA per la gestione partecipativa del rischio di alluvione, volta al miglioramento della consapevolezza del rischio e al miglioramento della partecipazione pubblica

**1.2** Adattamento della metodologia IMRA per la gestione partecipativa del rischio di alluvioni al contesto legale ed amministrativo italiano

**1.3** Contributo al kick-off meeting

**Responsabile di progetto:** *Carlo Ferranti*

**Gruppo di lavoro:** *Valentina Vitale, Paola Malvati, Silvio Bagnini, Gianni Fangucci, Raffaella Nocco*



**2<sup>nd</sup> ERA-Net CRUE Research Funding Initiative**

***Integrate, Consolidate and Disseminate***

***European Flood Risk Management Research***

## **PREMESSA**

L'Autorità di Bacino del fiume Tevere ha aderito alla II call del Consorzio CRUE ERA-net con l'obiettivo di mettere a punto e sperimentare, in collaborazione con gli altri partners del progetto, una metodologia di comunicazione e di partecipazione da rivolgere alle comunità locali insediate nelle aree classificate a rischio di inondazione.

Il ruolo dell'Autorità nel gruppo di partners è sostanzialmente legato alle competenze specifiche che l'ordinamento italiano assegna a questo ente: sviluppare metodologie tecnico-scientifiche per la individuazione delle aree inondabili mediante la conoscenza delle dinamiche fluviali (portate, altezza e velocità dell'acqua, piani di esondazione), delle realtà territoriali (morfologie, usi del suolo, pianificazione urbanistica, aree e paesaggi storici) e delle valenze ambientali (zone umide, aree Natura 2000, parchi ed aree protette)

All'interno delle aree inondabili, l'Autorità di bacino individua e perimetra le aree a rischio (R1,R2,R3,R4) mediante una specifica conoscenza della vulnerabilità dei beni esposti e dell'intensità dell'evento atteso.

Questa complessa attività condotta dall'Autorità di bacino del Tevere si esprime attraverso il Piano di assetto idrogeologico (PAI) che rappresenta il principale strumento di pianificazione territoriale nel settore della difesa del suolo e di programmazione degli interventi per la messa in sicurezza.

Mentre l'Italia si dotava di questi forti strumenti di pianificazione l'Europa emanava la direttiva 2007/60 CE "Flooding" in cui viene fornito un quadro di riferimento a livello comunitario per la individuazione delle aree inondabili secondo criteri comuni e per la definizione di comuni politiche per la difesa del suolo; inoltre la Comunità europea, anche nella Direttiva Flooding così come nella WFD 2000/60, sottolinea la centralità della partecipazione pubblica nei processi di pianificazione ex ante

Il PAI è stato definitivamente approvato con DPCM del mentre la nuova direttiva europea "Flooding" 2007/60 è oggi in corso di recepimento nell'ordinamento italiano con le difficoltà legate alla configurazione del sistema italiano caratterizzato dalla filiera programmazione - interventi - primo allertamento - protezione civile

## **I OBIETTIVO INTERMEDIO**

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Il progetto di ricerca IMRA ha come principale obiettivo la definizione di una metodologia di comunicazione e partecipazione (the concept) per accrescere la consapevolezza delle popolazioni insediate nelle aree a rischio di inondazione e favorire così comportanti virtuosi e migliori pratiche.

Il contributo dell'Autorità di bacino è quello di contribuire alla formazione del "messaggio" della comunicazione. L'oggetto della partecipazione e della divulgazione presso le comunità locali insediate nelle aree a rischio sarà costituito dalle conoscenze di dati, di metodologie e di risultati prodotti dall'Autorità di bacino per la redazione del PAI. Con questo obiettivo l'Autorità ha fornito, fino ad oggi, un sintetico dossier sul caso di studio individuato - il bacino del fiume Chiascio in Umbria- in cui sono raccolti alcuni dei principali dati posti alla base dell'elaborazione del PAI.

Di seguito si riporta la documentazione fino ad oggi elaborata sul caso di studio:

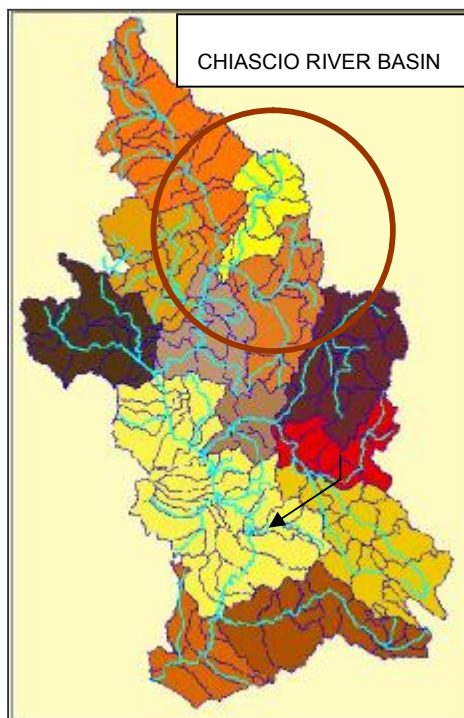
## TEVERE RIVER BASIN AUTHORITY – PRESENTATION

River basin authorities were instituted in Italy by the law n.189 in 1989. The authorities operate according to a technical and institutional cooperation between State (national level) and Regions (local level)

The river basins, as the physical units that can overcome only administrative boundaries, are defined by the law and we have six national river basins and different river basins at the local level. Tevere river basin national authority is a public agency where are represented the regions that belong to the water catchment area and four Ministries (environment, infrastructure, agriculture, culture)

The main task of the authorities is the elaboration of the river basin management plan which can be implemented for functional areas or for sub – basins (like the Chiascio sub basin for example) by an interdisciplinary approach dealing with geology, hydrology, ecology, landscape, land use and government of territory

The river basin management plan is the cognitive, regulatory and technical instrument that can define actions and rules for soil conservation and protection, proper utilization of water, based on physical and environmental characteristics of the territory concerned: the water catchment area



According to the Water Framework Directive 2000/60/CE also in Italy will be instituted the river basin districts (by the transposition of the directive into Italian law) which will replace the river basin authorities in leading out the river basin management plan.

### The Tevere river basin

The Tevere river basin covers a vast area of central Italy, located between 43° 47' latitude north and 41° 40' latitude south of the equator and 11° 37' longitude west and 13° 26' longitude east of Greenwich and it is situated

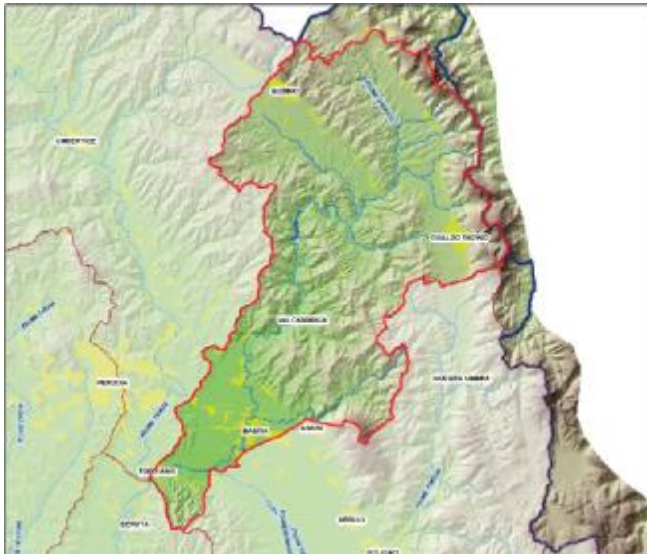
approximately in the center of Ecoregion 3. The river basin covers a territory of about 17,156 km<sup>2</sup>.

The length of the Tevere river is 409 km. The straight line distance between the source and the mouth of the river is 225 km, with a ratio of 1.82. The height of the Tevere river's source is 1268 m above sea level.

The Tevere river basin intersects the administrative borders of six regions. Almost 90% of the river basin's territory is covered by the regions of Umbria and Lazio. The remaining part falls within the regions of Emilia Romagna, Tuscany, Marche and Abruzzo. There are 335 local administrations in the river basin.

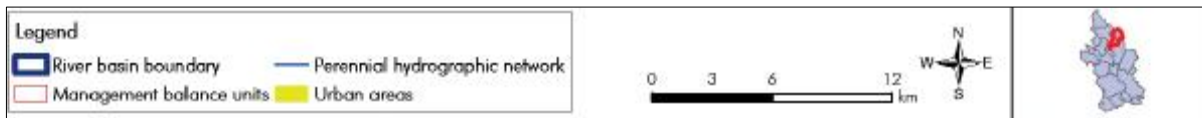
We choose the Chiascio river basin as case of study area because it is characterized by local communities lively and available for public participation. In this basin the hydraulic risk phenomena are governed by means of Hydrogeological Setting Plan elaborated by Tevere river basin Authority. The consultation phase and the implementation of the observations made to the plan were organized with the main local government and can be considered a first experience of public participation.

### The Chiascio river sub- basin



The Chiascio river originates from the Apennine ridges at an altitude of about 850 m asl and after 95 km it flows into the Tevere river. The river basin is delimited by mountains which reach a height of over 1000 m asl, characterized by calcareous and very permeable rocks. Groundwater circulation feeds some perennial springs that originate short watercourses with significant flows also in the dry season.

In the middle part of the Chiascio river, the main geological formation is flysch. The soil has low permeability due to the marly component of the terrain and consequently there is a marked torrential surface circulation. The



northern portion of the Northern Umbrian Valley, which comprises one of the most important alluvial aquifers of the river basin, is located in the final stretch of the river.

Valfabbrica artificial lake, created along the Chiascio river has a potential capacity of about 150 cubic meters. The main urban agglomerates are represented by the urban settlements of Gubbio and Gualdo Tadino in the intra-Apennine valleys and Bastia and Santa Maria degli Angeli in the Umbria valley.

The Eugubina valley and the northern Umbrian valley are characterized by intense agricultural activities. Productive activities are concentrated in the three main valley areas. In the Umbria valley industrial areas develop along the main lines of communication of the municipalities of Bastia and Assisi. The main productive sectors are metal processing and manufacturing, foodstuffs, tobacco, and textile industry. The mainly industrial productive agglomerates are located in the Eugubina valley area. The main productive sectors are metal processing and manufacturing, cement production, lime and chalk, ceramics.

In the following tables are shown some of the main basin features concerning population, and human activities

### Chiascio river (TV81)

#### SURFACE AREA

km2	727.25
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#### POPULATION

Resident Population	
1981	78.881
1991	79.851
2001	84.404
2009	86.916

#### LANDSCAPE

N inhabited locality	Tot urbanized area Km2	Tot area of the Protected Areas	% of Prot Areas / BU	Number of interested municipality
152	29,6	79,5	10,9	15,0

#### AGRICULTURE

##### Farms by Total Surface Area Classes (ha)

	Total	< 1	1-10	10-50	>50
1981	5.761	1.478	3.208	889	186
1991	5.592	1.505	3.049	842	194
2001	5.025	1.443	2.652	765	166
2009	4.797	1.443	2.469	721	164

##### Farms Surface Areas by Total Surface Area Classes (ha)

	< 1	1-10	10-50	>50
737	11.189	17.828	31.837	
762	10.592	16.848	33.384	
732	9.552	15.655	28.603	
739	8.971	14.621	28.364	

##### SAU (surface area usable for agriculture) (ha)

Total	Irrigated	Irrigable
41.172		
39.626	3.183	6.065
33.924	2.186	5.450
31.717	1.388	5.030

##### IRRIGATED CROPS (ha)

	grain	vegetable	fodder	fruit plants
1981	15.846	276	8.359	104
1991	13.666	136	6.348	126
2001	11.613	154	4.737	177
2009	10.302	-110	2.729	174

##### IRRIGATED SURFACE AREA OF MAIN IRRIGATED CROPS (ha)

	corn	vegetable	fodder	other seed crops (tobacco, fruit plants)	total
2001	2.963	154	2.369	5.674	177

##### Yearly water consumption, total and per unit of irrigated land

	total (millions m <sup>3</sup> )	Unit (per ha)
1981	24	333
1991	29	396
2001	28	386
2009	30	419

##### WATER VALUE FOR SEED CROP IRRIGATION

	Unit (Euros per ha)	Total value (Euros)
average 1987-2001	1.512	12.695.292

##### Total costs (mln. ...) for the irrigation section (only seed crops) derived from different gross water withdrawal reduction hypotheses

	grain (corn)	vegetable plants	fodder	tobacco-sunflower-	total
1%	0,0388	0,0023	0,0358	0,0888	0,1657
2%	0,0775	0,0046	0,0716	0,1776	0,3314
3%	0,1163	0,0070	0,1074	0,2665	0,4971
4%	0,1550	0,0093	0,1433	0,3553	0,6828
5%	0,1938	0,0116	0,1791	0,4441	0,8286
6%	0,2325	0,0139	0,2149	0,5329	0,9943
7%	0,2713	0,0163	0,2507	0,6217	1,1600

#### WATER-DEMANDING INDUSTRIAL ACTIVITIES

	LOCAL UNITS															
	DA	DB	DC	DD	DE	DF	DG	DH	DI	DJ	DK	DL	DM	DN	DO	DP
1981	113	330	17	152	42	0	11	36	954	114	38	34	6		1.029	
1991	130	372	18	116	48	2	10	18	172	118	49	83	3		1.117	
2001	161	321	11	101	66	1	8	26	122	148	86	94	1		1.196	
2009	188	333	11	77	62	2	7	15	202	156	106	117	-0,46		1.247	

	WORKERS PER LOCAL UNIT															
	DA	DB	DC	DD	DE	DF	DG	DH	DI	DJ	DK	DL	DM	DN	DO	DP
1981	1.688	2.898	343	421	300	1	66	413	2.380	797	496	199	30		9.911	
1991	1.432	2.584	145	333	295	4	50	295	1.652	799	838	290	46		8.958	
2001	1.298	2.158	33	365	363	4	62	350	1.694	1.037	884	380	16		8.900	
2009	1.353	1.891	-168	317	400	7	66	307	1.607	1.113	1.106	441	-14		8.446	

	WATER NEEDS (m3)															
	DA	DB	DC	DD	DE	DF	DG	DH	DI	DJ	DK	DL	DM	DN	DO	DP
1981	3.002.531	4.509.202	313.181	463.406	2.211.459	5.698	263.166	454.773	4.045.184	1.470.111	197.584	55.845	104.818		58.513.134	
1991	3.024.669	4.406.675	127.233	300.366	2.170.685	26.456	266.517	324.952	3.146.672	1.530.610	355.278	83.625	93.172		58.444.705	
2001	3.439.641	3.723.053	29.840	306.330	2.817.114	26.526	410.326	394.625	3.222.643	2.622.793	375.011	103.076	21.045		17.002.948	
2009	3.205.680	3.244.833	-96.502	368.281	2.984.841	26.409	442.216	337.320	2.732.126	2.171.274	468.975	123.360	-15.717		15.961.095	

	VALUE OF WATER FOR INDUSTRIAL USE (Euros/3year)															
	DA	DB	DC	DD	DE	DF	DG	DH	DI	DJ	DK	DL	DM	DN	DO	DP
1991	0,03	0,04	0,03	0,06	0,61	0,00	0,62	0,57	0,05	0,04	0,17	0,32	0,06			
2001	0,04	0,05	0,08	0,09	0,62	0,00	0,63	0,40	0,08	0,05	0,23	0,46	0,06			

	VALUE OF WATER FOR INDUSTRIAL USE (Euros/year)															
	DA	DB	DC	DD	DE	DF	DG	DH	DI	DJ	DK	DL	DM	DN	DO	DP
1991	80.737	169.685	6.822	23.202	26.731	937	4.944	22.684	183.270	58.608	99.365	27.147	3.093			
2001	121.754	188.347	2.234	35.291	46.901	199	11.394	38.731	383.752	196.395	88.104	47.048	1.731			



### About hydraulic risk in Chiascio river basin

In August 2002, the Tevere River Basin Authority laid out a plan for the prevention and protection of hydrogeological risk (Hydrogeological Setting Plan) which was definitively approved in April 2006, the maps of the plan are legally binding and above urban planning level. The criteria and methods used by the Tevere River Basin Authority – were used more or less homogeneously also by all the other national river basin authorities – that are the mapping authorities – because they were defined by a Decree of the President of the Republic that guaranteed a homogeneous application on a national scale.

The implementation of the maps is the result of a collaboration between the Regions (in our case of study Umbria region) which are part of the river basin and which represent local level stakeholders and the Tevere River Basin Authority which provides the methodologies and maintains a river basin scale vision and approach. However, the Tevere River Basin Authority is responsible for the plan and the maps and it has the institutional task of updating the river basin plan and the relative maps

The main problems concern updating territorial data, regarding both natural territories and areas subject to anthropogenic pressures and; about relationships with local communities the main problems concern the public participation, and – above all – sharing of the norms that regulate floodable areas.

As we said before, the problem of hydraulic risk in our area (Chiascio river basin) was already addressed by the hydrological setting plan, but the question concerning civil protection and including preparedness, flood forecasts and early warning systems are separated – according to Italian law – from river basin planning and are placed under the jurisdiction of the Civil protection department (central and local levels). In fact in 2005 the Province of Perugia, Umbria Region, the Prefecture and the municipalities of Perugia, Assisi, Bastia Umbra, Valfabbrica and the Mountain Community of Mount Subasio organized the first exercise on a "hydraulic scenario" in the territory of the River Chiascio. The areas of the event were included in areas at risk R3 - R4 identified in flood maps of the Tevere River Basin Authority.

The challenge for the future is to increase awareness of local populations and share the need for virtuous behaviour; the public participation in defining the rules of the territories at risk absolutely contributes to the land management, giving rise to land-use provisions, as binding instruments to regulate private and public behaviour in order to not make the risk situations worse, or create new ones. But public participation is a long term process in which individuals, institutions and associations are responsible to make a contribution in risk prevention and management.. This is why one of the guidelines for the common implementation strategies of the Water Framework Directive 2000/60 CE provides a useful reference for the next steps concerning public participation; the path defined by the guideline could also be used for the process of public participation that we face in our area of study

First of all, it is necessary integration between the policies of city urban planning (residential and industrial expansions) and the policies of protection and enhancement of rivers habitat.

### About 2007/60 CE Directive

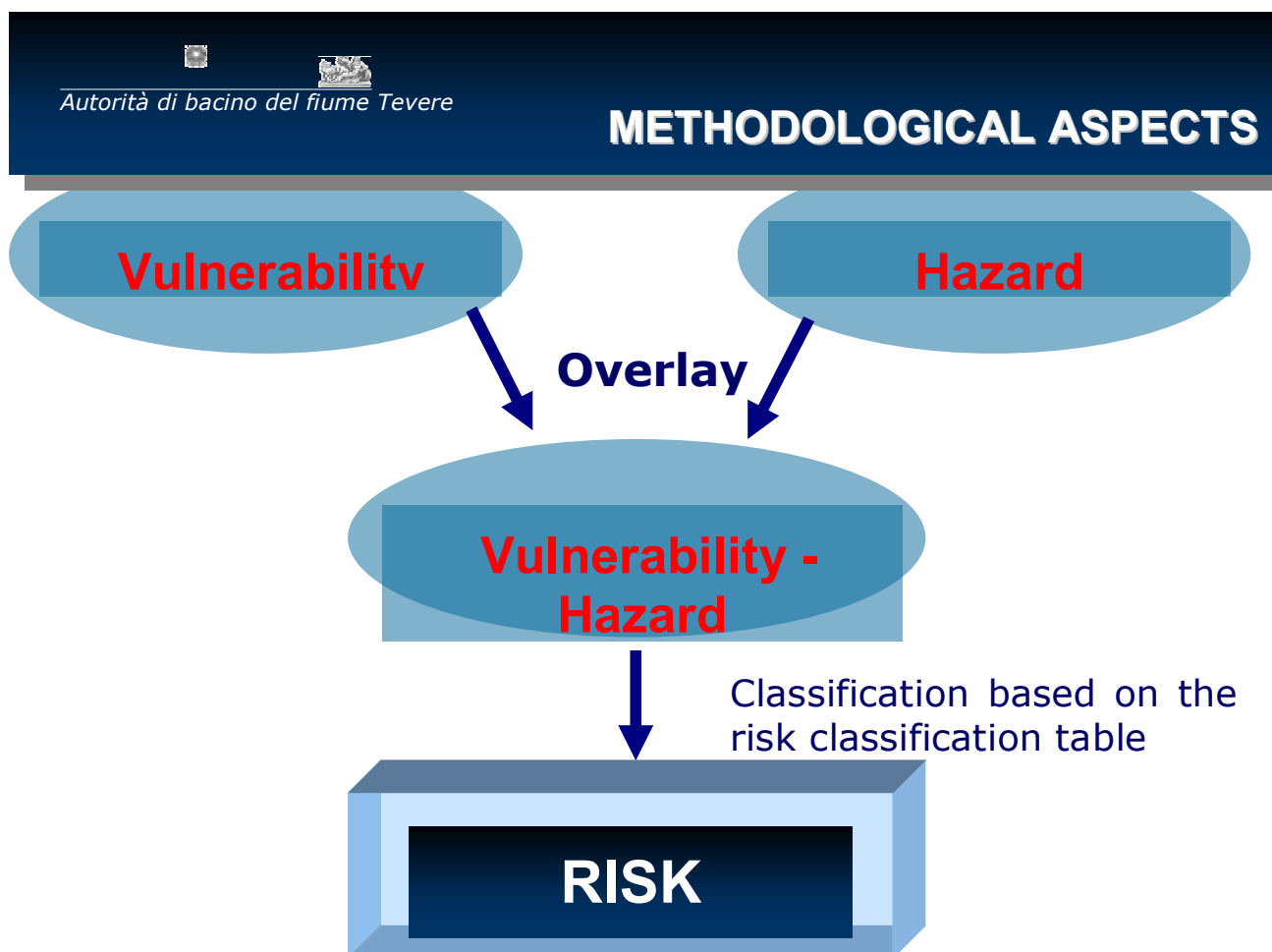
Italy welcomes the Directive for the management of flood risk in Europe, which will be the basic instrument for establishing the common framework to address a concerted EU action.

At the Italian Ministry of Environment has established a working group tasked with preparing the transposition of the EU directive into Italian law and Tevere river basin authority is a member of the working group.

Italian law about flooding is actually much more complex than Directive 2007/60 even if don't put the right emphasis on the issues of public participation and economic analysis. Moreover, the issue of civil protection is not currently integrated with the Hydrological setting plan (risk management plan); transposition of the Directive into Italian law is therefore an opportunity to better define these issues also based on the results of experience on Chiascio river basin

**In the following Annex are shown criteria, methods and products of the analysis**

## ANNEX



Each national and regional River Basin Authority, such as Tevere river basin authority, elaborates its flood maps covering the entire national territory according to directives issued expressly from a central level in order to guarantee homogeneity. The Tevere River Basin Authority's experience is described below and, with the exception of a few differences, it is substantially similar to that of the other river basin Authorities.

The flood maps are elaborated by the Tevere River Basin Authority on a 1:10.000 scale for all the Tevere river's main hydrographic network. The Regions develop the maps for the rivers of the secondary hydrographic network according to criteria and methods set by the national river basin Authority. The maps contain the limits reached by the flood waters in three return periods of 50, 200 and 500 years. They are elaborated on the basis of topographic soil models and elaborations of steady and unsteady state mathematical models. The maps do not contain the water levels of the cross-sections. However, they are indicated in tables together with the water velocity.



## **flood hazard maps**

Flood hazard maps are developed in relation to the hydrogeological setting objectives in the following river areas:

### *Area A – hydrogeological setting objectives*

- to guarantee the free outflow of 50-year return period flood waters
- to allow the free expansion of flood waters in the riverbed, respecting the natural river dynamics
- to guarantee the protection and recovery of the natural riverbed components functional to controlling environmental upheavals (riparian vegetation, morphology)

Area A is characterized by maximum hazard and it is defined by the limit of direct floodable areas of 50-year return period reference floods. Due to its vicinity to the watercourse, the evident hydraulic interconnections and the presence of fauna and flora habitats peculiar to the river ecosystem, area A is considered a river pertinent area. For Area A, the *Hydrogeological Setting Plan (Piano di Assetto Idrogeologico, PAI)* requires the possibility of free outflow of water from the watercourses and from the reference floods; therefore further settlements, other than those already existing and delimited as areas at risk, are not considered compatible with the hydrogeological setting objectives of the area.

### *Area B – hydrogeological setting objectives*

- to guarantee that the natural flood expansion areas (return time = 200) are maintained;
- to control anthropogenic pressures;
- to guarantee the recovery and protection of the historical and environmental heritage;

### *Area C – hydrogeological setting objectives*

- to assure a sufficient level of safety to the population settled in the area (flood areas return time = 500), the assets and the venues by means of civil defence Plans.

## **flood risk maps**

Flood risk maps are developed on a 1:10 000 scale for all the rivers of the main and secondary hydrographic networks of the Tevere river basin. Regarding the main hydrographic network, the maps contain the delimitation of the assets exposed to flood risk : the exposed assets (therefore considered as areas at risk) are divided into 4 levels of risk from R1 to R4 according to the vulnerability of the exposed assets and to the intensity of the flood event.

Regarding the secondary hydrographic network, the river areas have not yet been identified, therefore the delimitations in the risk maps are based on historical case records of precedent flood events or flood events notified by the local authorities.

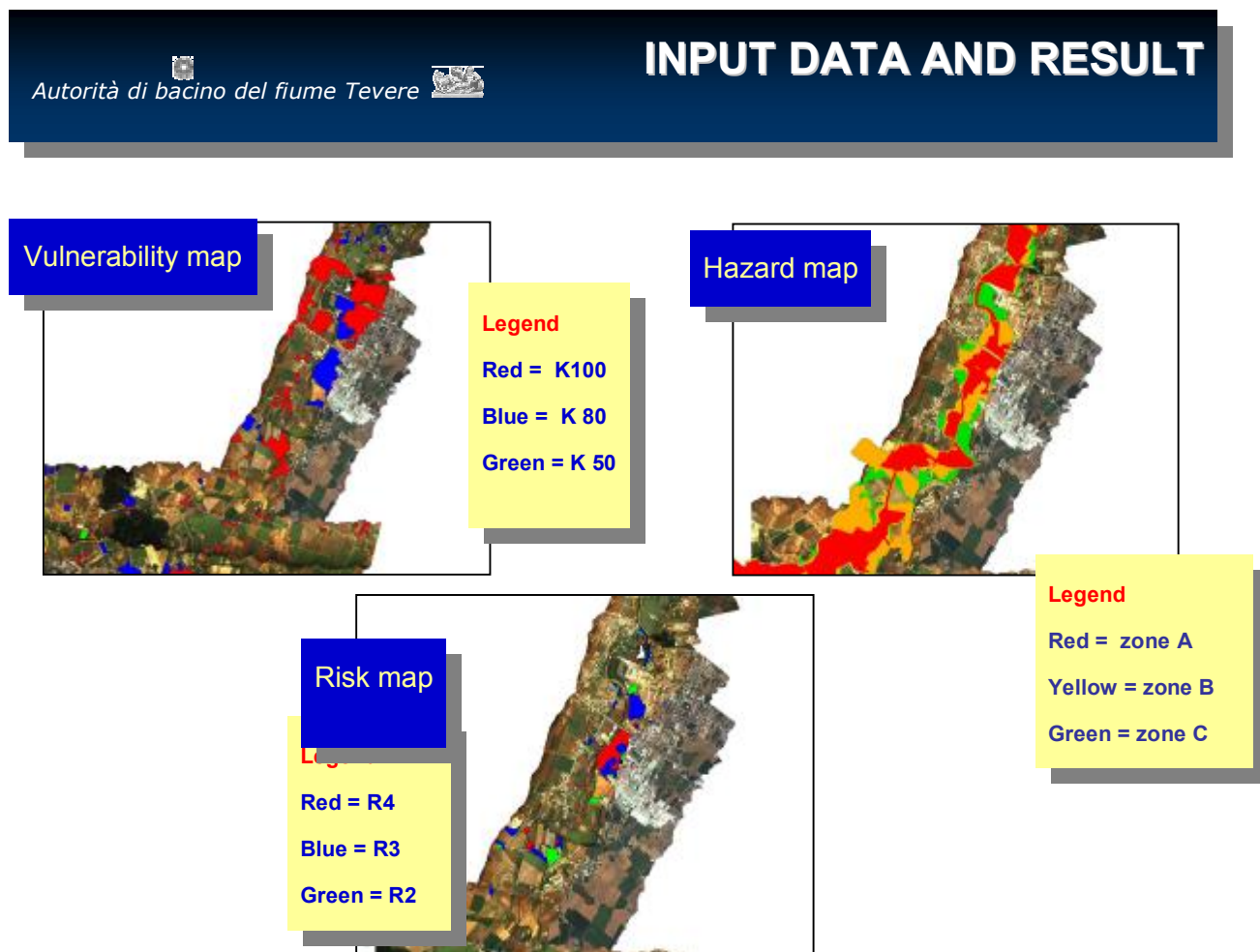
## **legal value of the maps**

The maps are part of a river basin sub-plan called *Hydrogeological Setting Plan (Piano per l'assetto idrogeologico – PAI)*. It is a sector spatial planning tool. Once it is approved it is fully binding from a legal point of view, it regulates private property and it is above other spatial planning levels and tools which are bound to implement it.

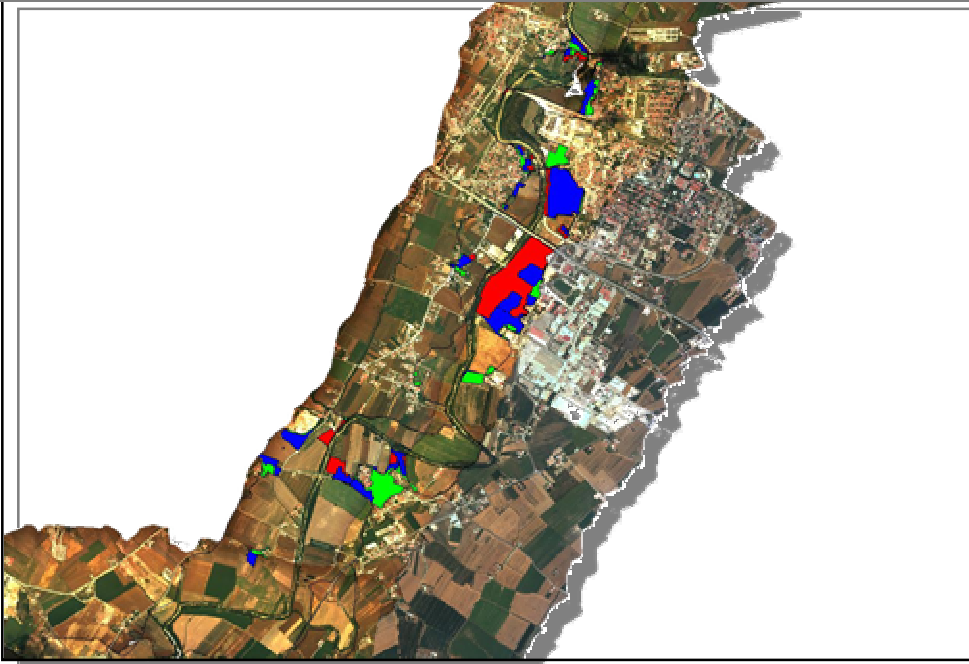
### Access to the maps

The maps are published in an integral version on the Tevere River Basin Authority's website. They can be downloaded in the form of vector maps and can be consulted in paper version at the Department for Public Relations of the Tevere River Basin Authority.

The paper version is in A0 format tables with a 1: 10 000 scale topographic basis and colour thematic layers.



**HYDRAULIC RISK: R4, R3, R2 AREAS**  
 Autorità di bacino del fiume Tevere

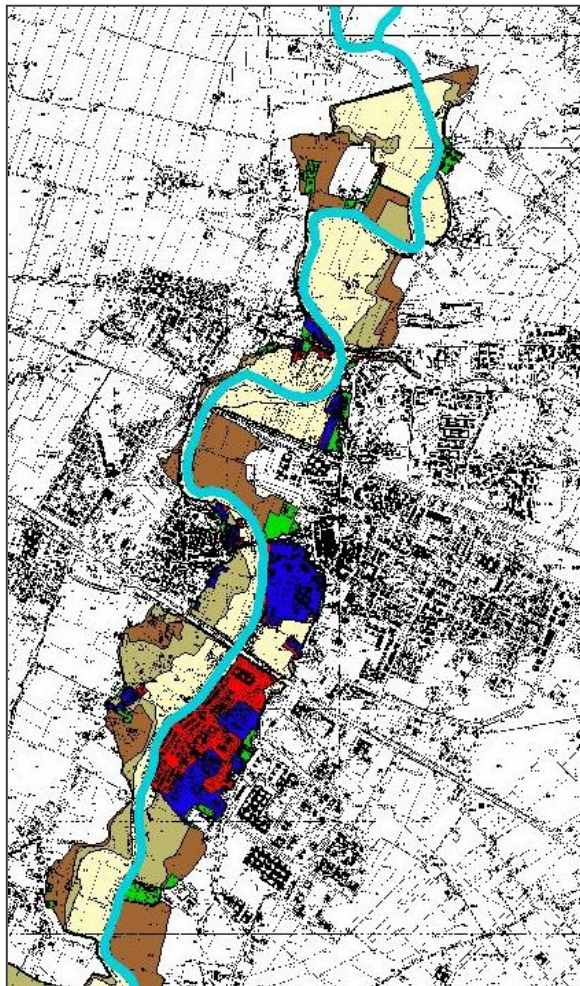


**Legend**




- Red = R4
- Yellow = R3
- Green = R2

FROM THE OVERLAY OF HAZARD ZONES AND VULNERABILITY OF THE EXPOSED ASSETS WE DERIVE THE RISK AREAS

**HAZARD AND RISK IN CHIASCIO RIVER**



**Fluvial areas**

-  Area A - Tr 50 years
-  Area B - Tr 200 years
-  Area C - Tr 500 years

**Areas at risk**

-  Areas at R4 risk
-  Areas at R4 risk
-  Areas at R2 risk

### **1.2** *Adattamento della metodologia IMRA per la gestione partecipativa del rischio di alluvioni al contesto legale ed amministrativo italiano*

La prima sperimentazione della metodologia messa a punto per il progetto IMRA avverrà alla metà di gennaio 2010 quando, secondo la programmazione delle attività stabilita tra i partners, si svolgerà il primo incontro con i rappresentanti del contesto locale (stakeholders istituzionali e associazionismo locale). A questo fine è stato già predisposto dal partner CNR RPPS un elenco ragionato dei possibili stakeholders ed è in corso di elaborazione un primo modello di "questionnaire" da somministrare ai diversi soggetti nel corso dell'incontro che tiene conto delle modalità di partecipazione al processo di piano, delle competenze amministrative in materia di difesa dalle inondazioni definite nell'ordinamento italiano. L'adattamento della metodologia al contesto legale ed amministrativo italiano sarà possibile in termini di progressivi aggiustamenti nel corso dei lavori per tener conto dei suggerimenti emersi dai dibattiti appositamente animati da esperti.

### **1.3** *Contributo al kick-off meeting*

Il meeting di avvio del progetto si è svolto nel mese di ottobre grazie all'organizzazione dell'ISPRA a Roma ed ha visto il progetto IMRA riscuotere interesse ed attenzione anche da parte dei ricercatori di altri progetti nell'ambito della II call.

Per la discussione interna tra i partners di IMRA è stata predisposta dall'Autorità di bacino e dal CNR RPPS una presentazione in cui sono riassunte le principali conoscenze sul caso di studio – il bacino del fiume Chiascio – ed in forma sintetica le metodologie adottate per la redazione delle mappe di pericolosità e di rischio. La seconda parte della presentazione realizzata dal partner CNR RPPS focalizza i principali obiettivi della partecipazione e gli elementi chiave del processo decisionale.

Di seguito si allega la presentazione