



Tevere River Basin Authority towards the WFD management plan

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Contents

- Water planning in Tevere RB before the WFD
- The CIS Pilot River Basin experience
- From Basin scale to local scale
 - Water balance at basin's scale
 - Water balance at hydrogeological structure's scale
 - Management Plan & Flooding Directive

River Basin Authority's institutional model



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- Regions: have been active in water planning since 1976 (administrative level)
- Objective: water body monitoring, discharge control, measures for household and industrial waste water treatment
- Tool: Regional water protection plan



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Context pre-existent to the WFD

River Basin Authority's institutional model



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- Other competencies at regional and provincial level:
 - Pipeline planning
 - Planning of the integrated water cycle for household use (adduction, distribution, treatment)
 - Public water abstraction licensing (surface and groundwater abstraction permits)
 - Discharge authorization



Context pre-existent to the WFD

River Basin Authority's institutional model



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- Subject : River Basin Authority (physical level) since 1989
- Objective: protection measures from landslide and flooding risk, soil conservation, water balance, water body environmental restoration
- Tool: River basin plan



Context pre-existent to the WFD

River Basin Authority's institutional model

- 6 National Authorities (regional and government bodies) 70% of the territory
- 18 Interregional Authorities 6% of the territory
- 23 Regional Authorities 24% of the territory



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Context pre-existent to the WFD

River Basin Authority's institutional model



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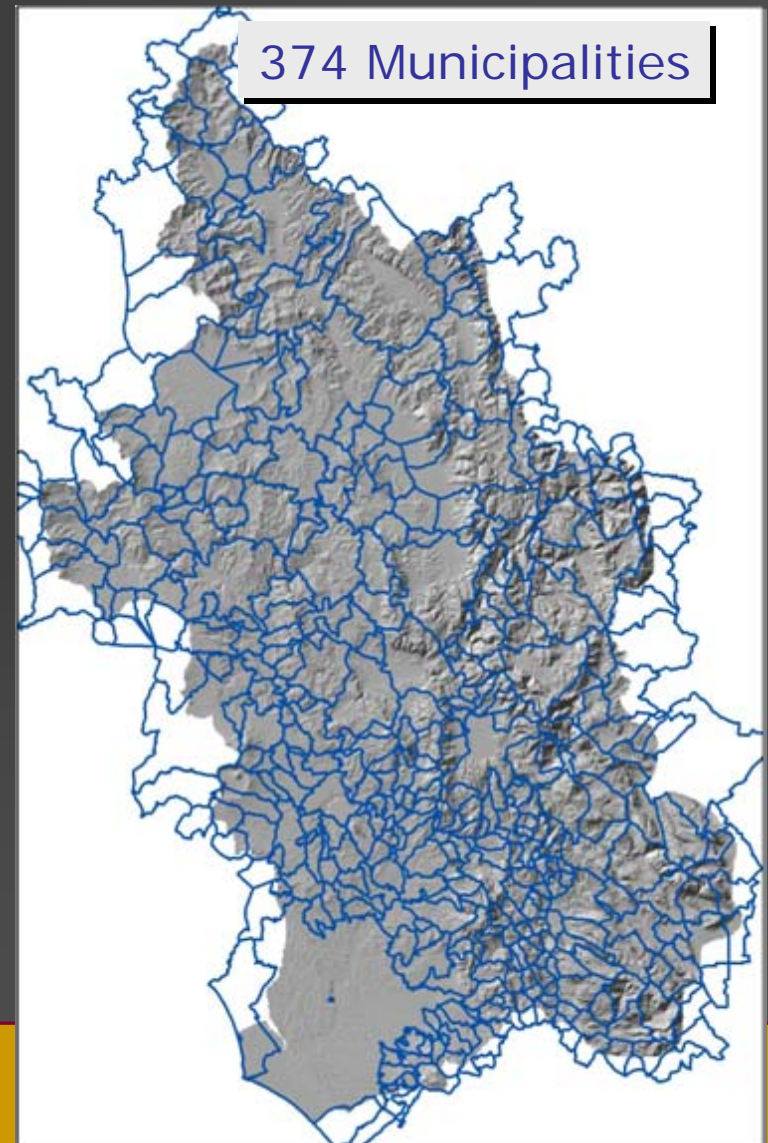
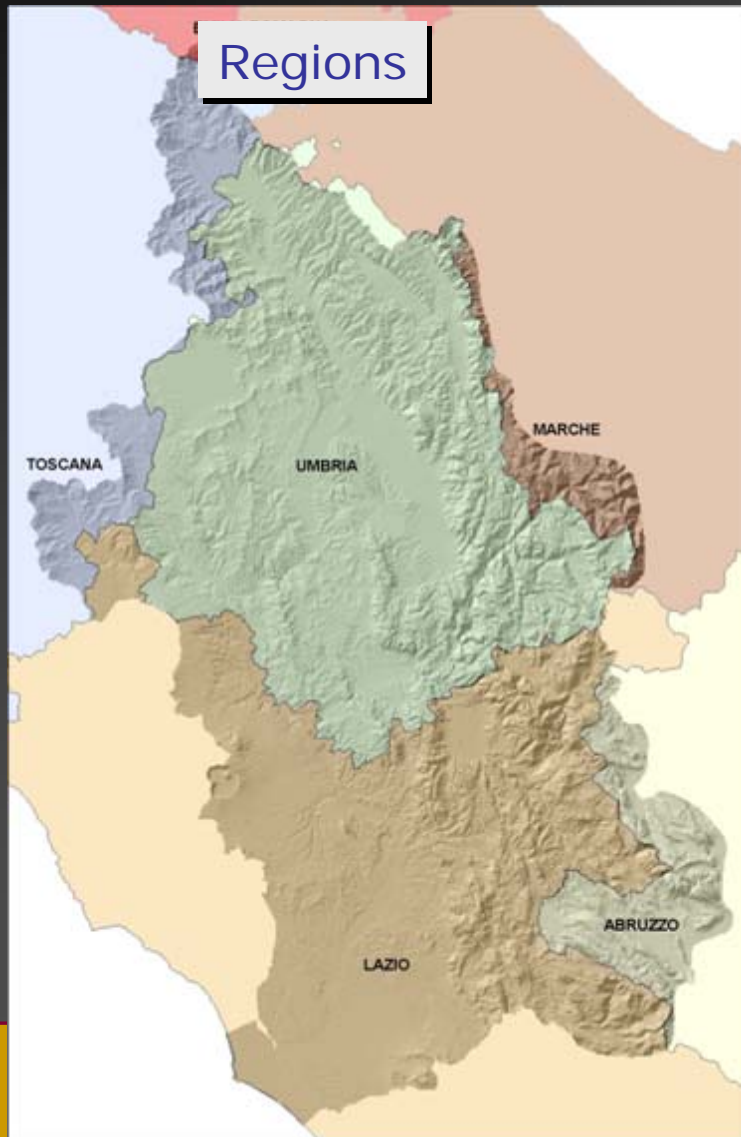
Current district delimitation

Administrative subdivisions in the Tevere River Basin



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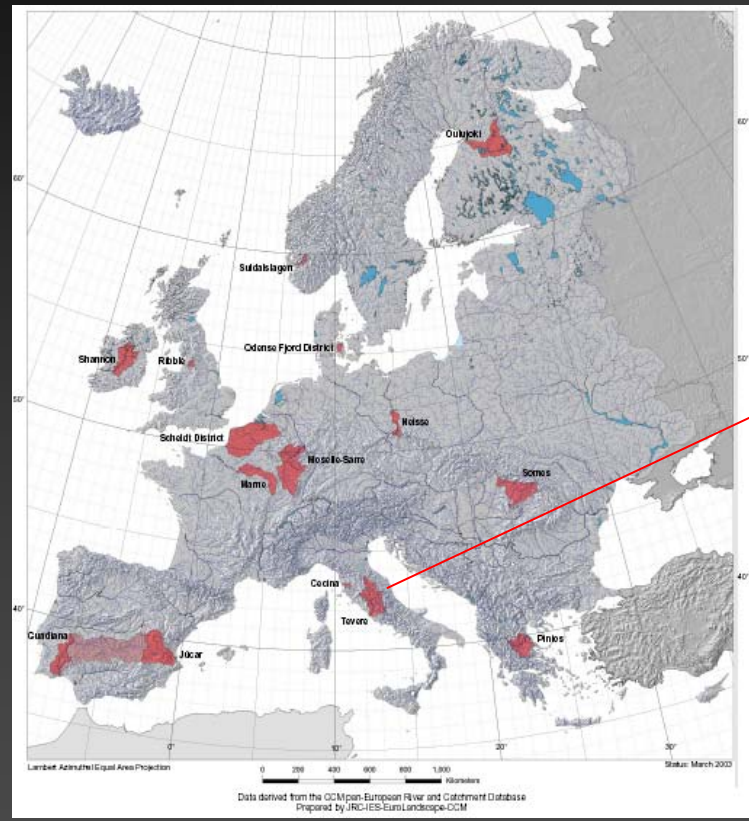


Pilot River Basins network



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The Tevere river basin authority was involved as a pilot river basin in the testing activity promoted by the European Commission within the Common Implementation Strategy for the implementation of WFD (2003-2005)

Organizations involved in the testing activity



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- Tevere River Basin Authority
- River Basins Authority of the Lazio Region
- Ministry of the Environment
 - APAT (National Environment Agency former ANPA)
 - ICRAM (Central Institute for Marine Waters Research)
 - ISS (Italian National Institute of Health)
 - University of Roma "La Sapienza"- Dipartimento di Scienze della Terra
 - University of Roma III - Dipartimento di Scienze dell'Ingegneria civile
 - University of Roma III - Dipartimento di Scienze della Terra
- Technical Offices of the Lazio, Tuscany, and Umbria Regions
- Technical Services Authorities of the Lazio Region
- ARPA Lazio (Regional Environmental Agency)
- ARPA Tuscany (Regional Environmental Agency)
- ARPA Umbria (Regional Environmental Agency)
 - ATO 1 Lazio (Authority for the Water management)
 - ATO 2 Lazio (Authority for the Water management)
 - ATO 1 Umbria (Authority for the Water management)
 - ATO 3 Umbria (Authority for the Water management)
- WWF
- Legambiente
- Gruppo 183

25 institutions



Tevere

pilot river basin article 5 report



pursuant to the water framework directive

http://www.abtevere.it/prb/inglese/index_ing.htm

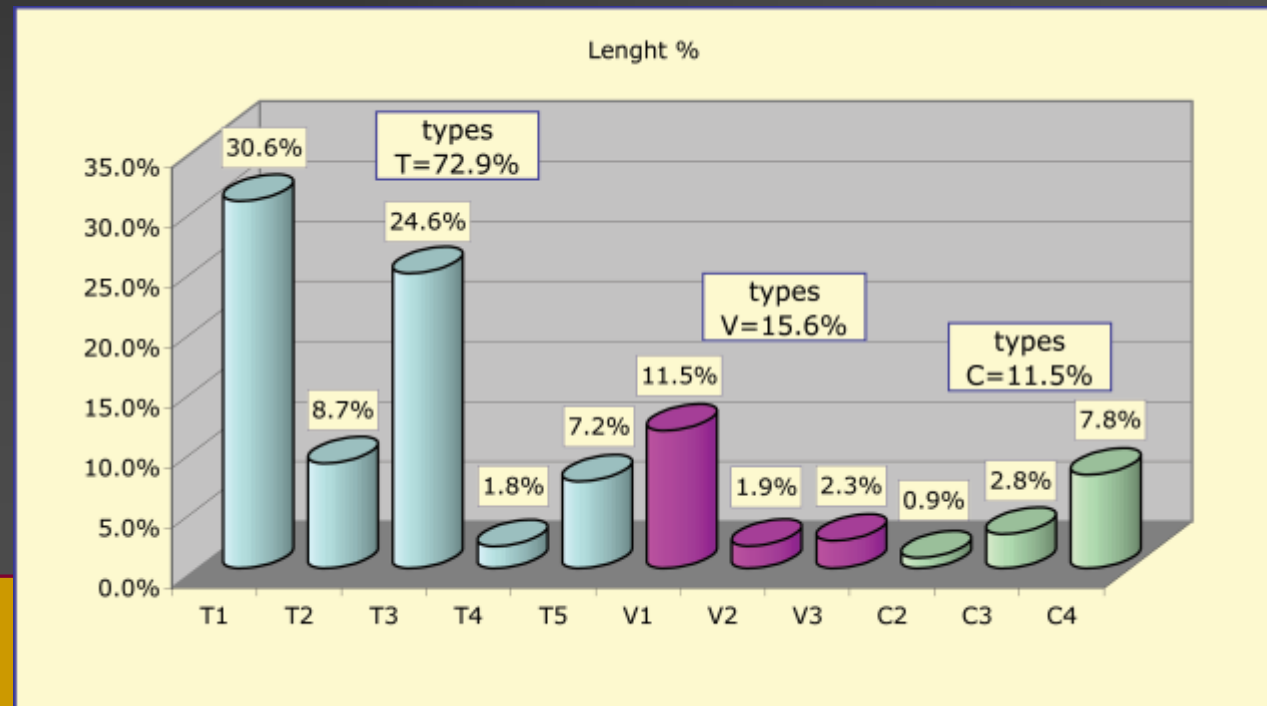


River Typologies

- from perennial streams
- system B
- based on 3 parameters: geology (3 classes), base flow (3 classes) and slope (2 classes)
- found 11 typologies



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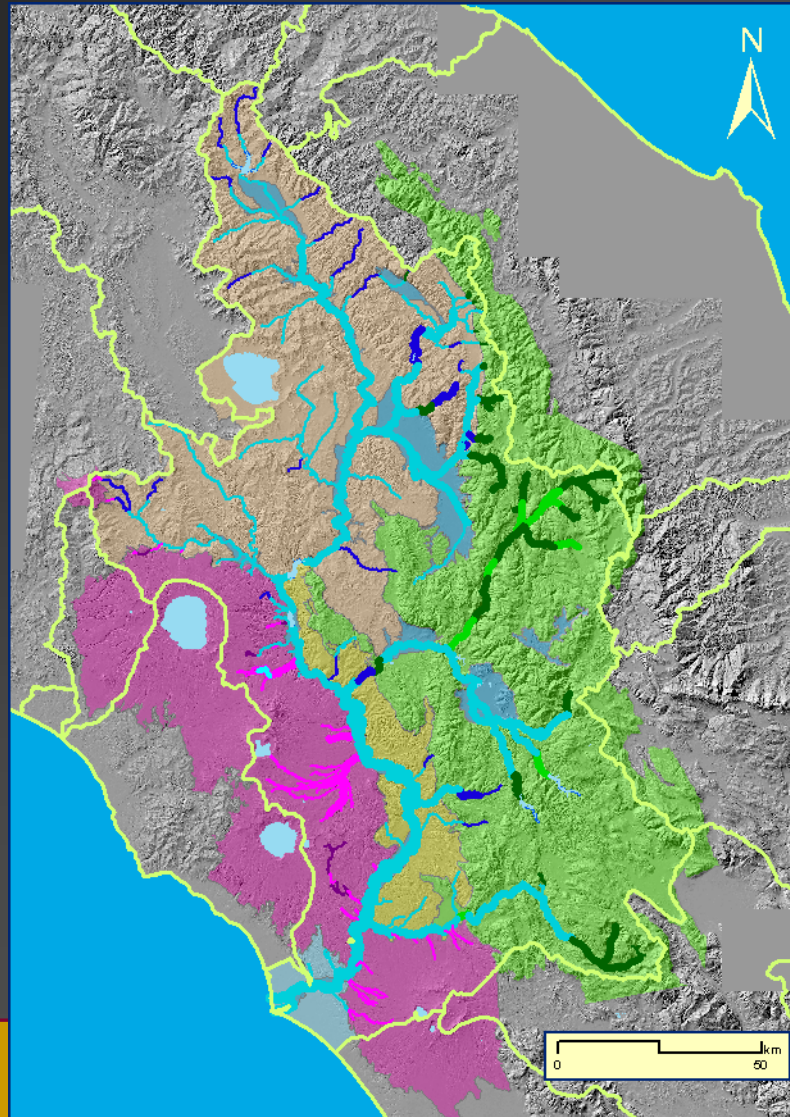
River Typologies




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type	geology	base flow	slope
T1	alluvial, clastic and flysh	low	low
T2	alluvial, clastic and flysh	low	high
T3	alluvial, clastic and flysh	mid	low
T4	alluvial, clastic and flysh	mid	high
T5	alluvial, clastic and flysh	high	low
T6	alluvial, clastic and flysh	high	high
V1	volcanic	low	low
V2	volcanic	low	high
V3	volcanic	mid	low
V4	volcanic	mid	high
V5	volcanic	high	low
V6	volcanic	high	high
C1	karst	low	low
C2	karst	low	high
C3	karst	mid	low
C4	karst	mid	high
C5	karst	high	low
C6	karst	high	high



legend

 River Basin Authority


geological areas

 upper Tevere river basin

 Apennine ridge

 volcanic structures

 Tevere's graben

 intermontane valley

 coast

river types

 T1

 T2

 T3

 T4

 T5

 V1

 V2

 V3

 C2

 C3

 C4

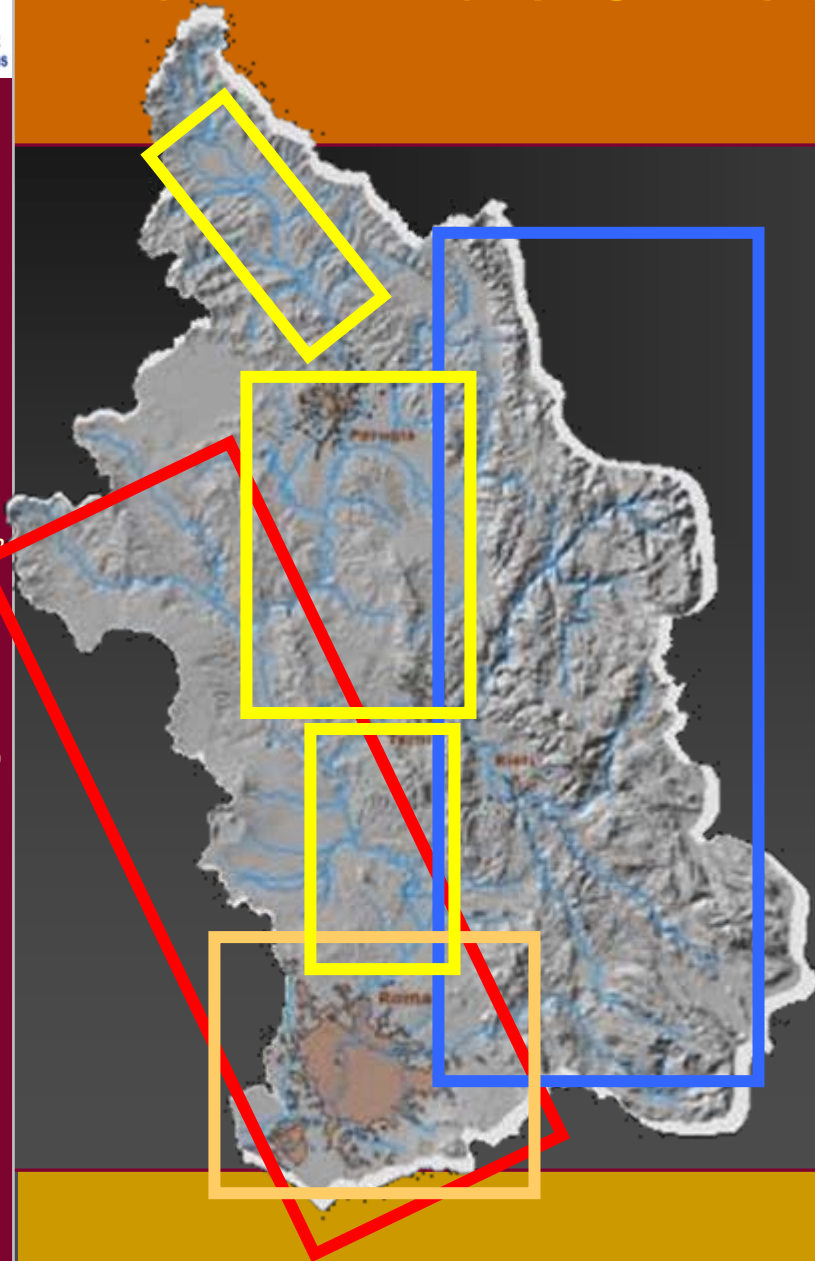
Main Article 5 Results



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- Overexploitation of Volcanic Aquifers

- Impact from Hydropower Plants on Surface Water Bodies

- Pollution in Urban Areas

- Pollution of Surface and Groundwater Bodies in the Alluvial Plains



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The Tevere river basin's experience brought to light specific aspects regarding Mediterranean river Basins that were scarcely dealt with in the guidance documents. In particular, the necessity of introducing the concept of water balance at river basin scale was underlined

This aspect is fundamental for the achievement of the WFD 's objectives in ecoregions characterized by scarce rainfall in the dry season

This is the main risk of failing the WFD objectives



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Towards management plan

WFD 2000/60 Management Plan

River Basin Planning

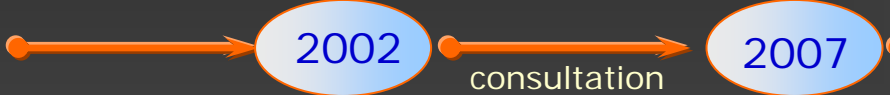
Water Balance (RB Authority)



Water Protection Plan and other plans (Regions)



Hydrogeological Management Plan (RB Authority)



2002
Adopted

consultation

2007
Approved

2007

Adopted

WFD 2000/60

Conformity check to
WFD objectives

Public Participation

Economic Analysis

Cost Recovery

2009

Management Plan



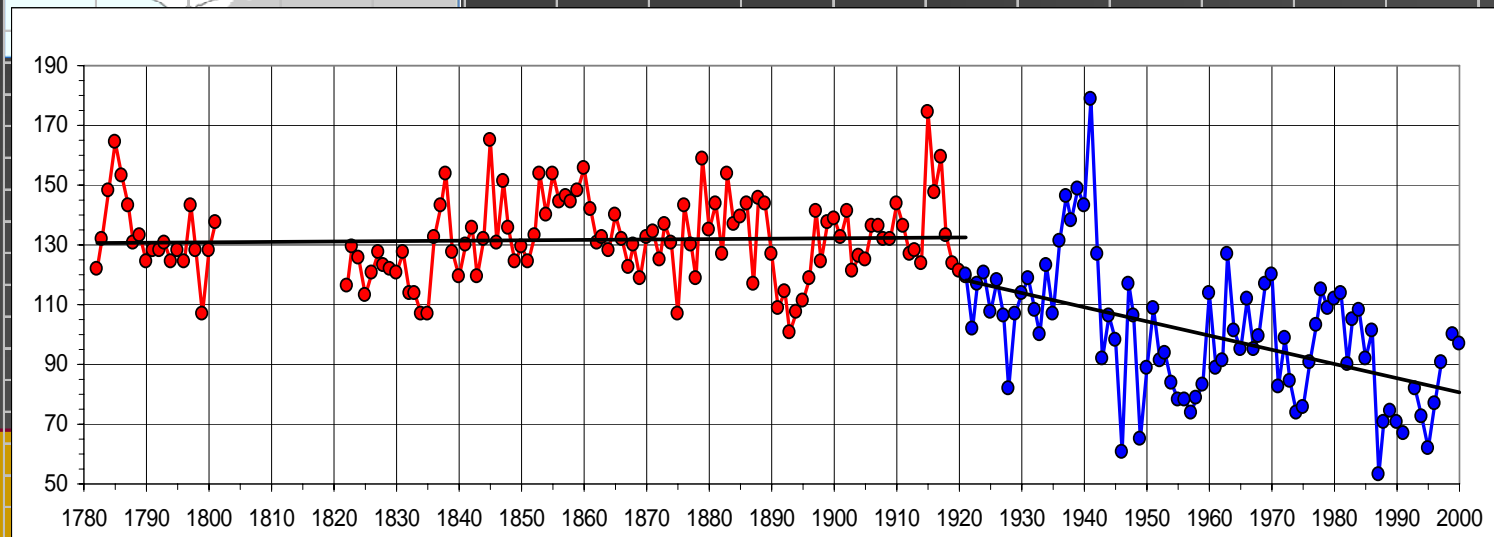
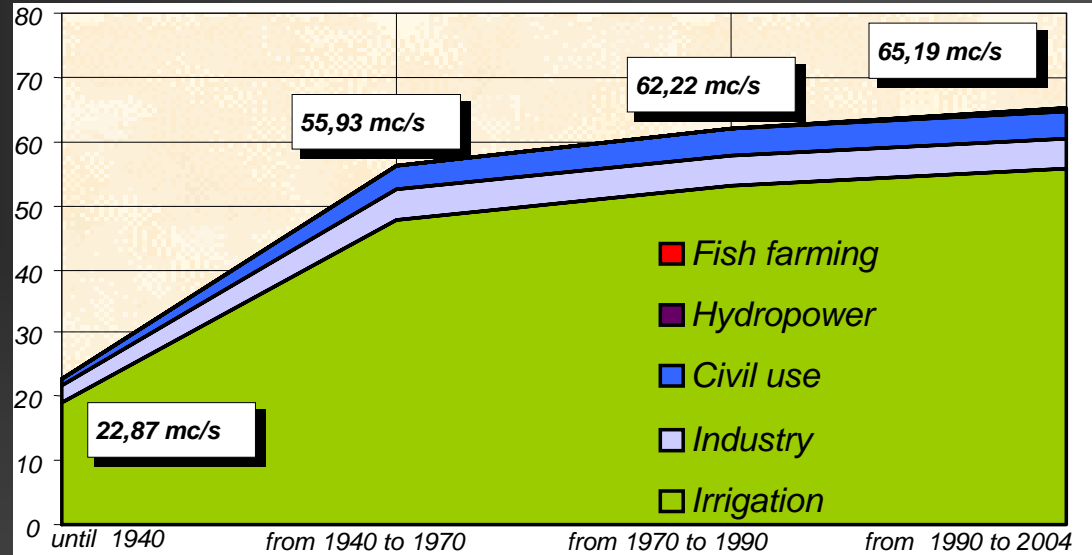
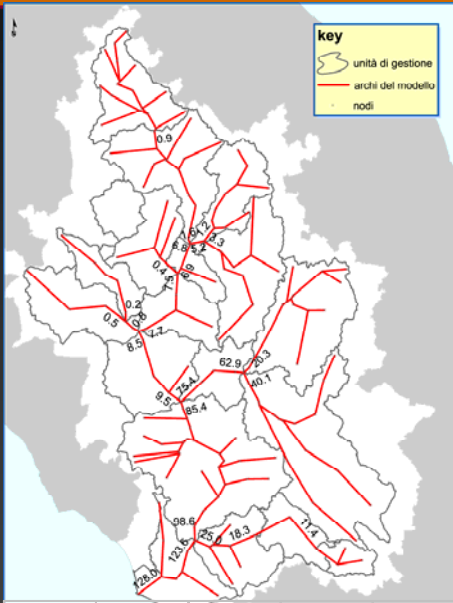
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1 level Water Balance at basin's scale

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Mean discharge at the mouth of the Tevere River during the dry season



Water Balance in the Tevere River Basin



1. we defined a sustainable value of the base flow at the mouth of the Tevere River (dry season value)

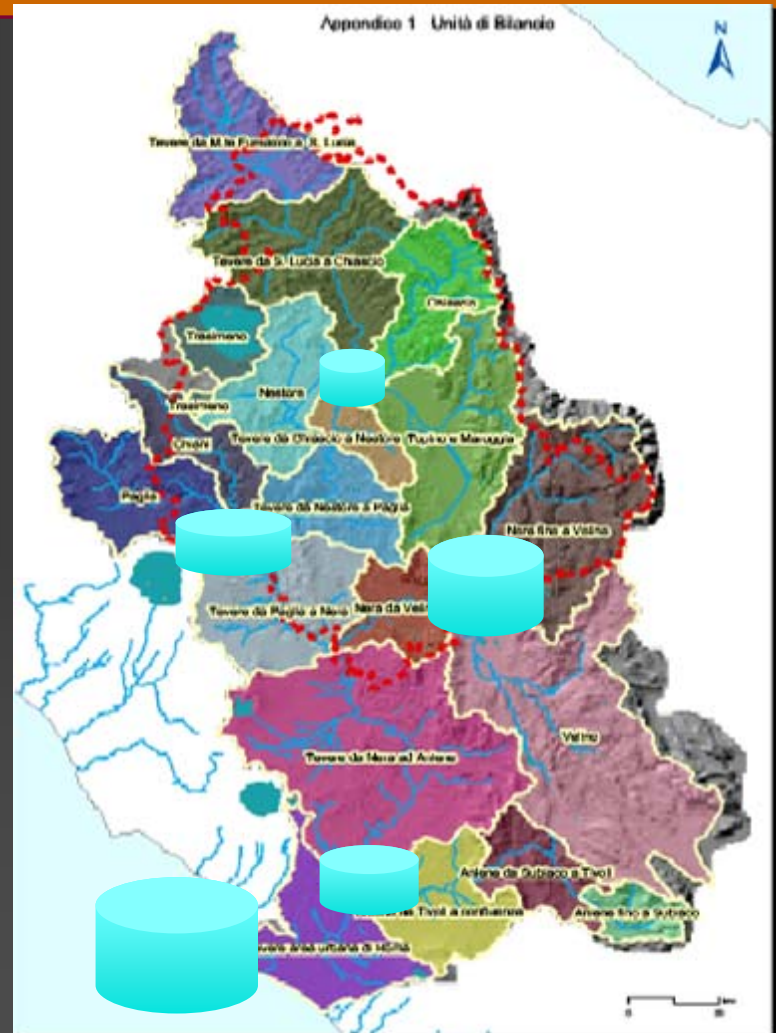


Water Balance in the Tevere River Basin



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1. we defined a sustainable value of the base flow at the mouth of the Tevere River (dry season value)
2. we identified 19 balance sub-units and evaluated the water availability
3. in each balance unit we identified the dissipative and non-dissipative uses

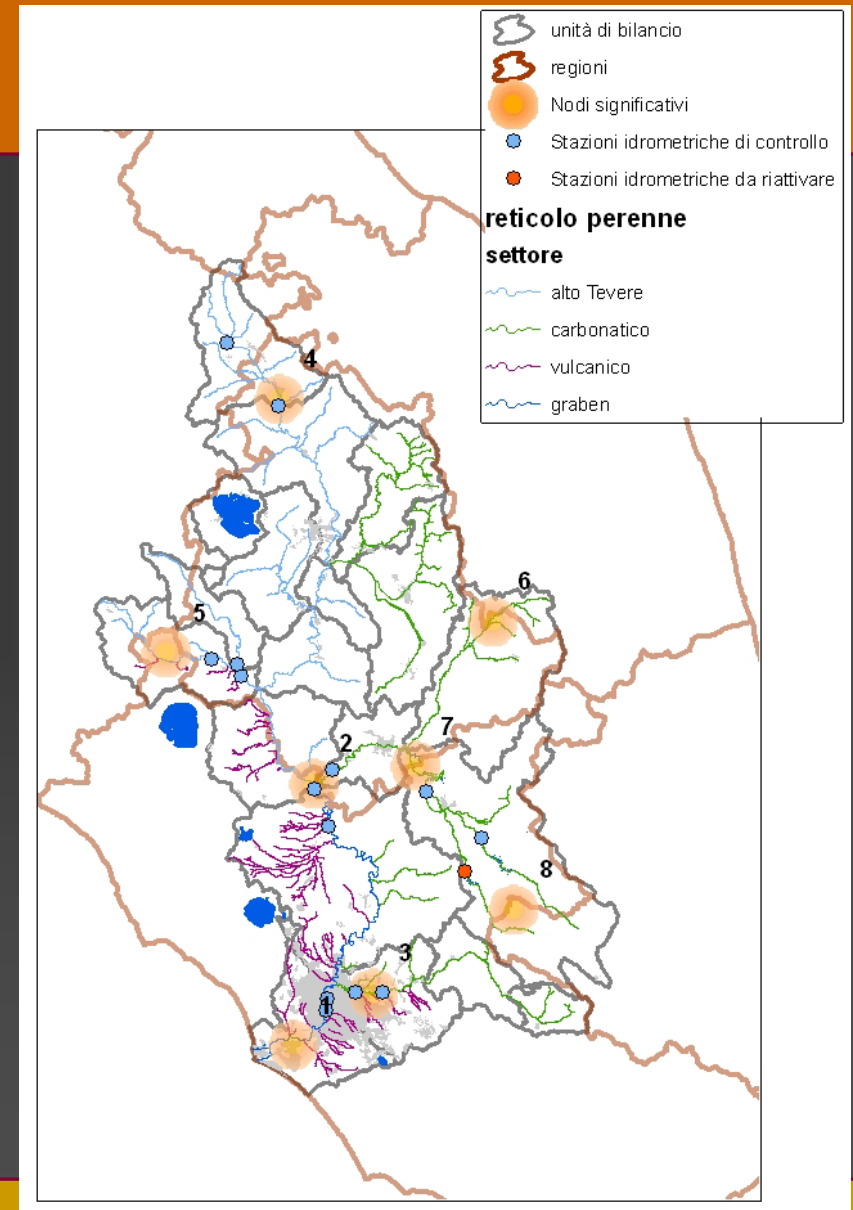


Water Balance monitoring points



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- Node 1: Tevere-Ripetta
- Node 2: Tevere-Nera
- Node 3: Aniene-Lunghezza
- Node 4: Tevere-S. Lucia
- Node 5: Tevere-Paglia
- Node 6: Nera-Visso
- Node 7: Nera-Velino
- Node 8: Salto-Turano



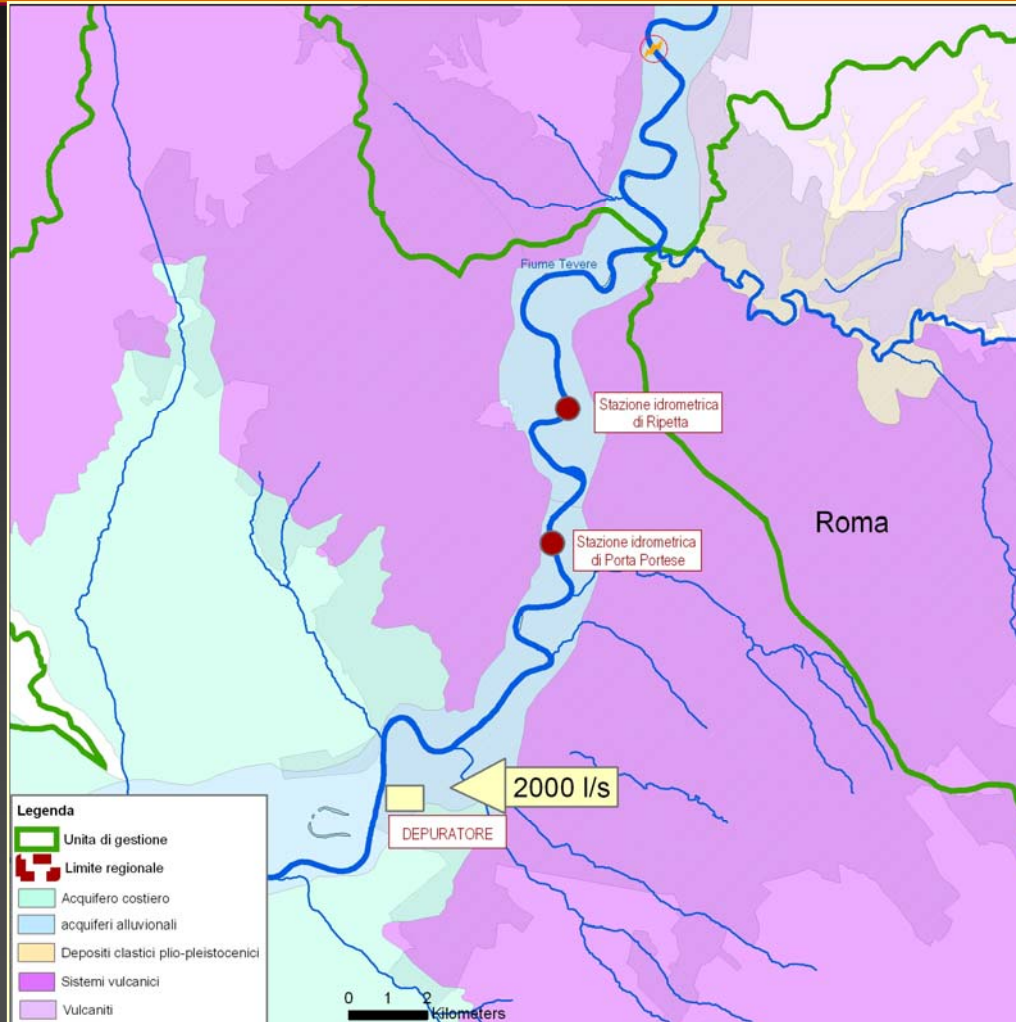
Water balance node (example) Tevere-Ripetta (1)



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Reference values

Natural base flow

$Q_{7,2}$: 124,0 mc/s

$Q_{7,10}$: 95,0 mc/s

Values Q_{7min} 1999-2007

REGIONE LAZIO

Mean Q_{7min} : 98,3 mc/s

Min Q_{7min} : 71,0 mc/s (2007)

Plan objectives

DBS: 80,0 mc/s

DMV: 47,0 mc/s

Proposed plan objectives

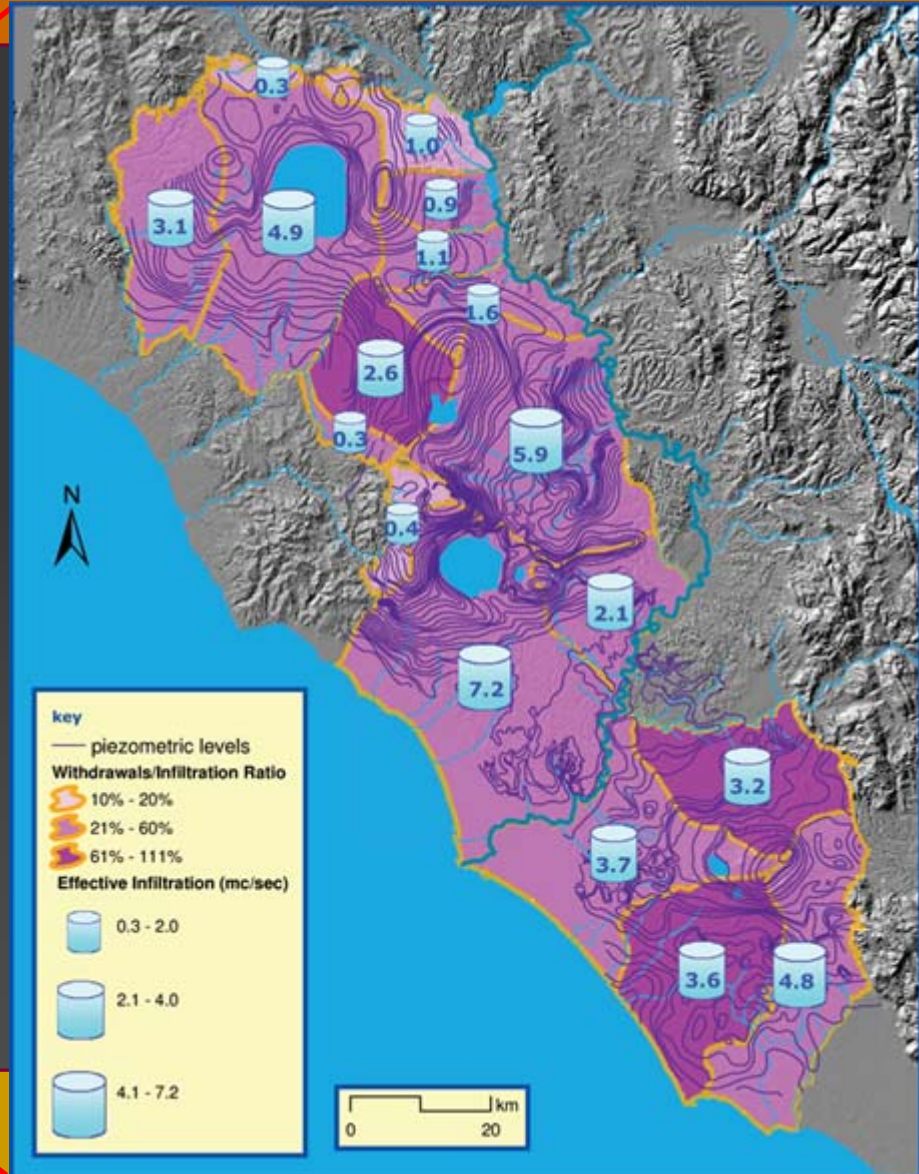
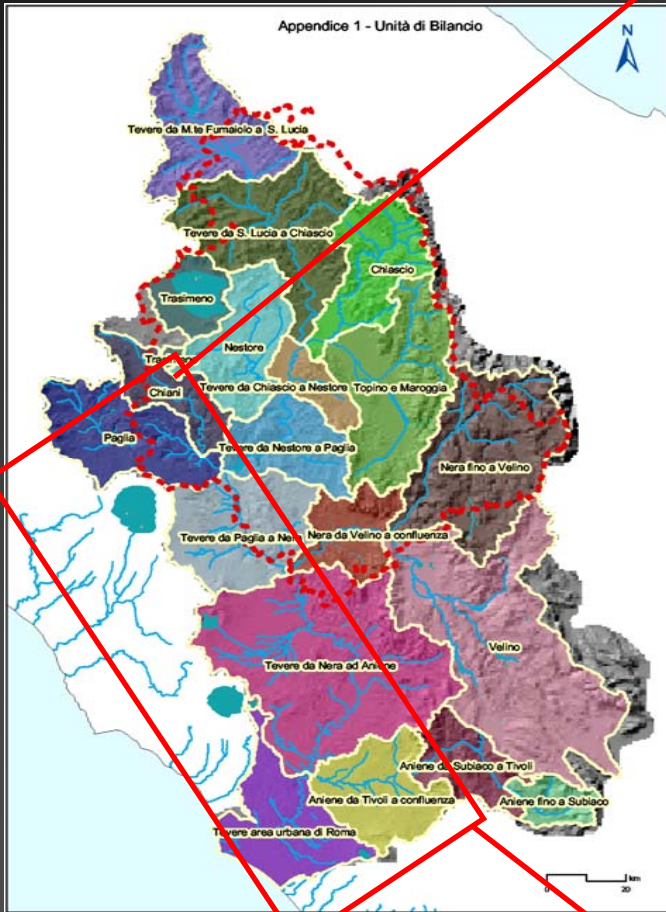
2 level Water balance in each hydrogeological structure (WFD & Dir 2006/118/EC)



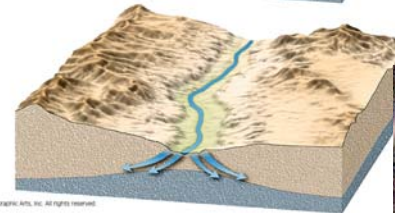
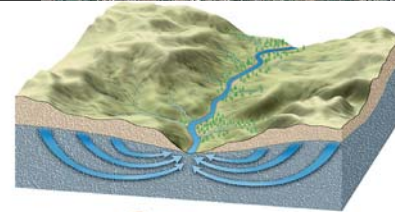
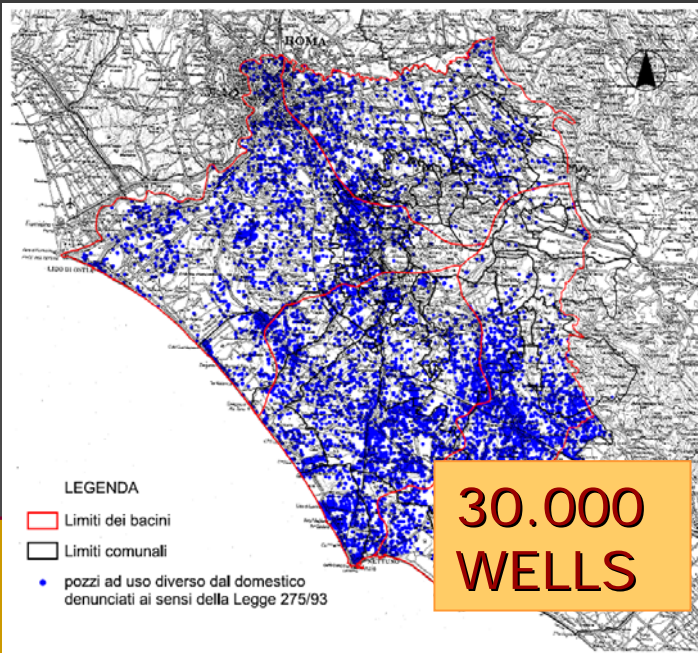
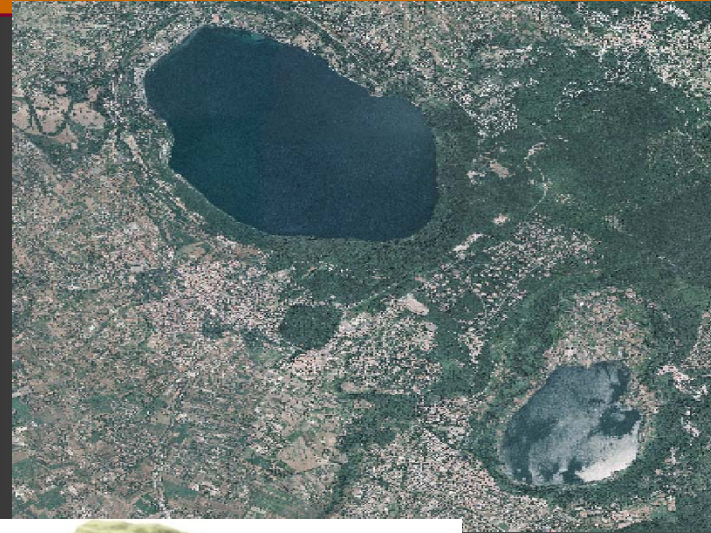
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- The WFD requires countries to promote sustainable use based on long term protection of available water resources and ensure a balance between abstraction and recharge of groundwater, with the aim of achieving good groundwater status by 2015
- Severe water stress can occur where the WEI exceeds 40% indicating strong competitions

Pressures and impacts in the volcanic aquifers



OVEREXPLOITATION OF THE ACQUIFERS



**REDUCTION
OF THE BASE FLOW**

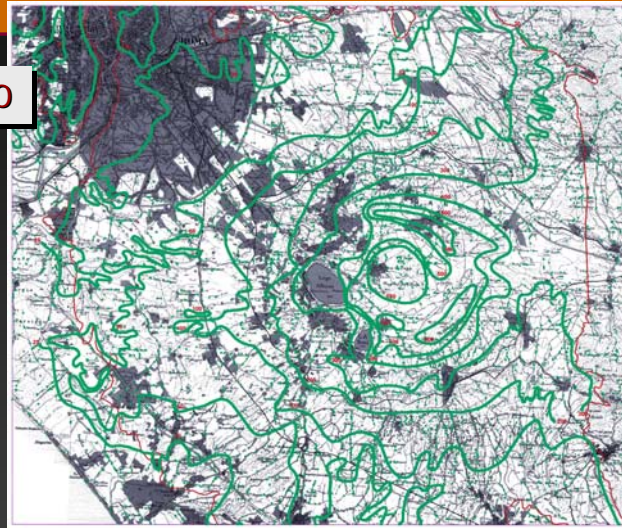


CRUCIAL ISSUE : WATER BALANCE



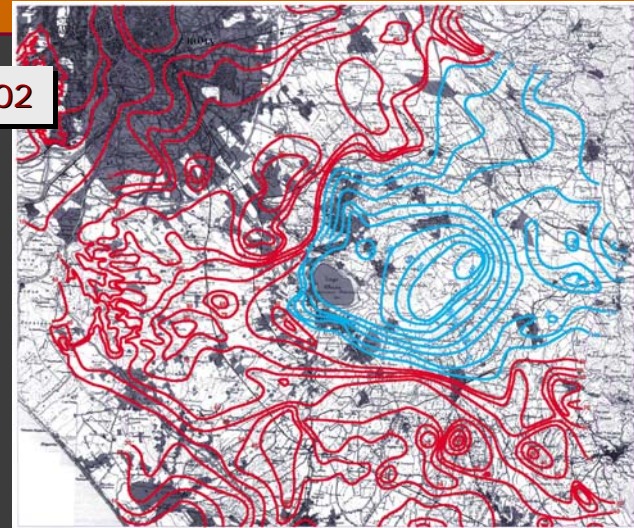
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1970



current

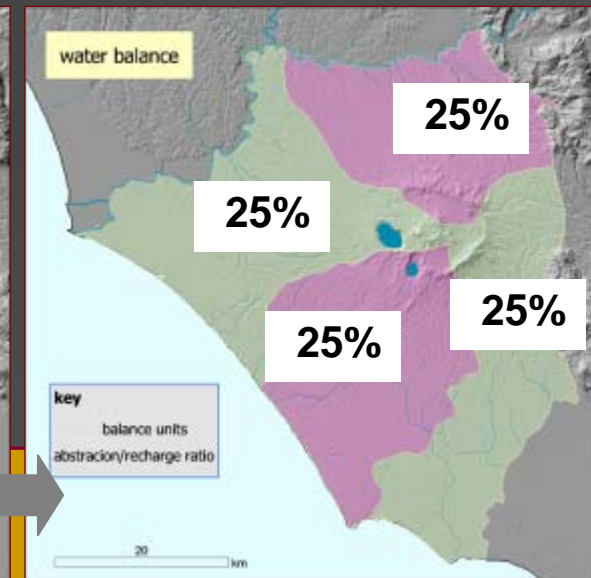
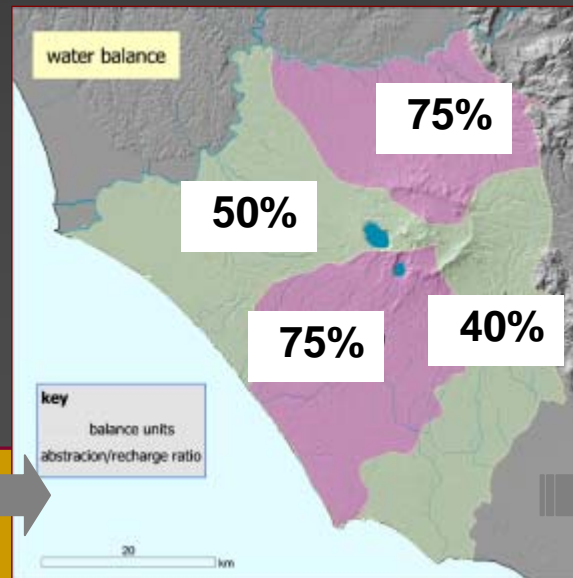
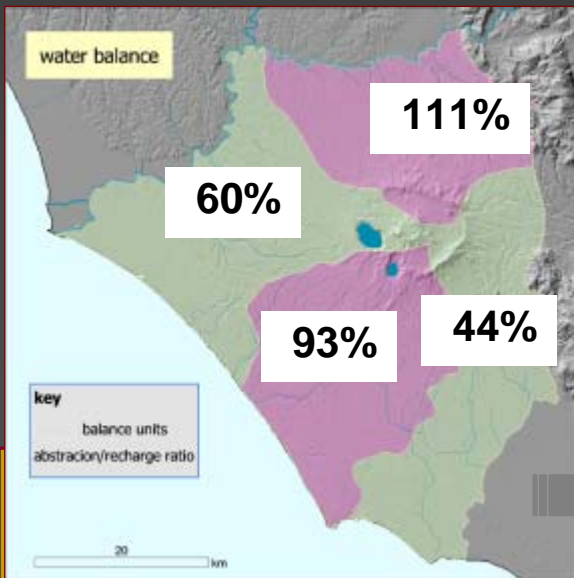
2002



in 3 years

in 2015

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Safeguard measures adopted since April 2004



WATER USES	MEASURES
AGRICULTURE	LIMITS TO AGRICULTURE CONSUMPTIONS Range 1000 – 3000 mc/years/hectar
INDUSTRY	WATER RECYCLING IN INDUSTRIAL PROCESSES LIMITS 100/mc/worker
HOUSEHOLDS, DOMESTIC USE NOT CONNECTED TO AQUEDUCT	LIMIT 70 mc/year per person LIMIT WELL SIZE
WATER REUSE	WASTE WATER REUSE FROM LOCAL PLANTS
	FLOW METERS ON WELLS
	MONITORING OF AQUIFER

Water body 1 "S.Cesareo-Colonna" WITHDRAWAL TRENDS (example)



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	Current	In 3 years	In 2015
IRRIGATION (l/s)	647	1211	797
INDUSTRIAL USE (l/s)	1172		
DRINKING WATER (l/s)	1181	1181	
TOTAL WITHDRAWAL (l/s)	3540	2392	797
% WITHDRAWALS	111%	75%	25%
NATURAL BASE FLOW (SW/GW) (l/s)	0	790	2390
EFFECTIVE INFILTRATION (l/s)	3189	3189	3189

INTEGRATIVE WATER SUPPLY MEASURES

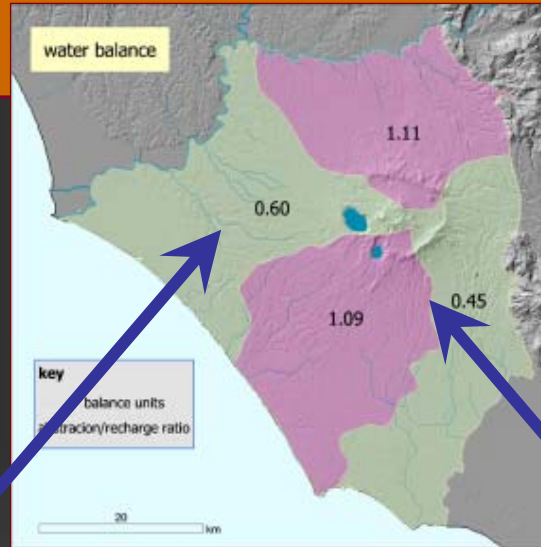


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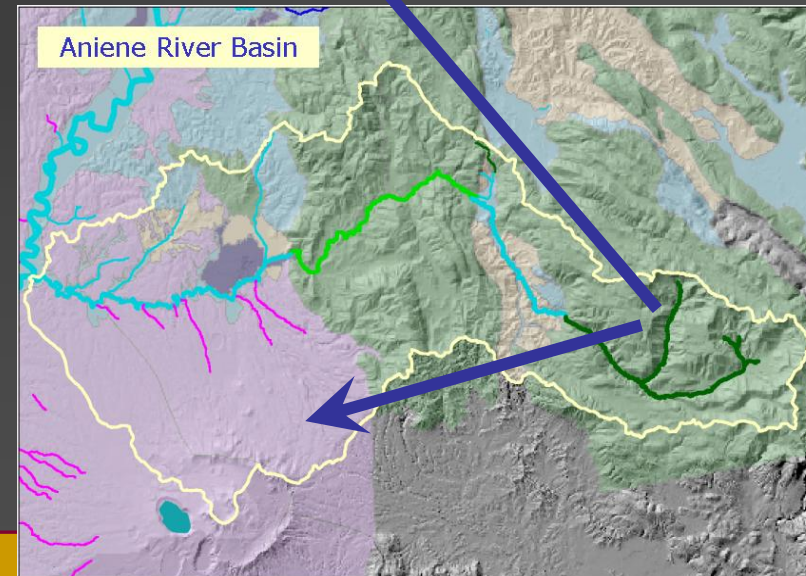
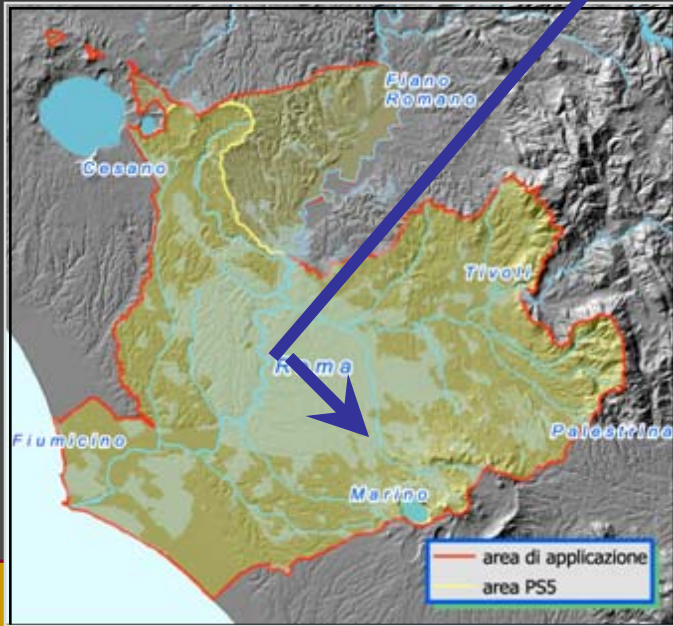


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Option 1



Option 2



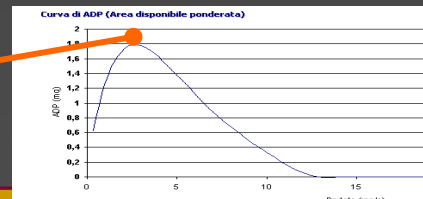
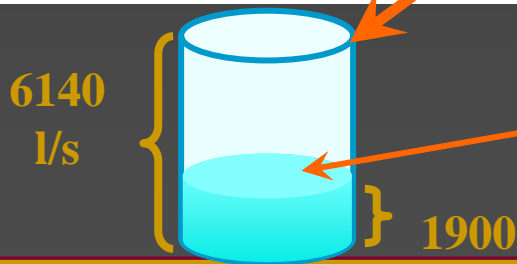
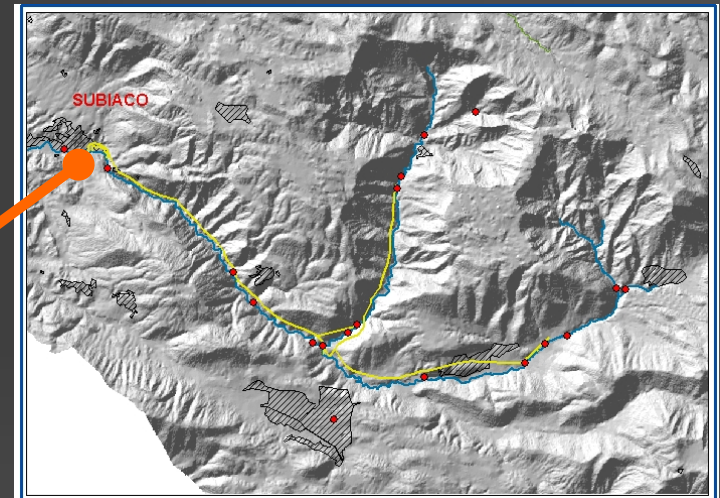
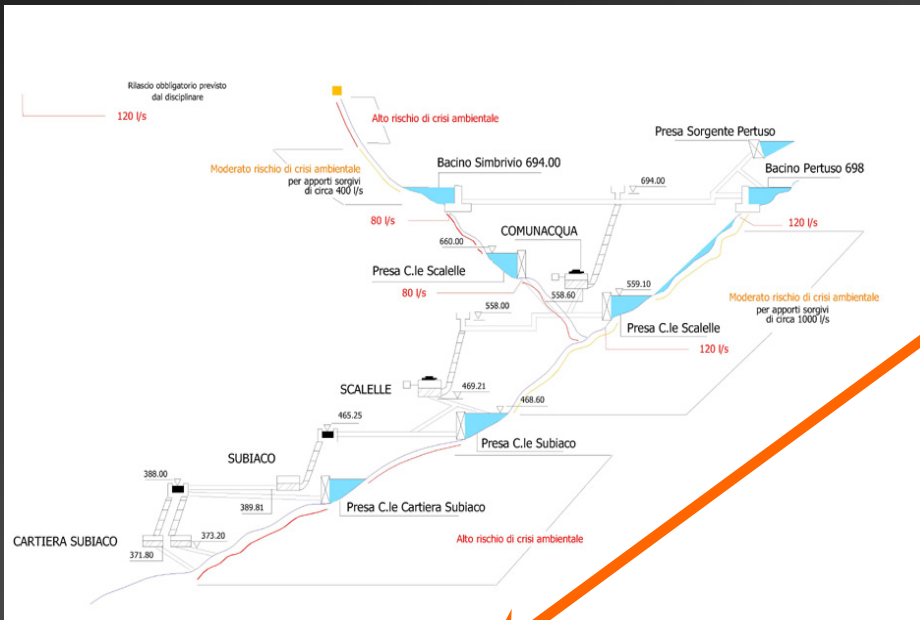
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Hydropower: different economic impact if we use the national constraint of “ minimum vital flow” or WFD “good ecological status”



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HMWB & MP (article 4.7 of WFD)

- An assessment of the impact of the Directive's application on national economy has not yet been carried out.
- The hydropower sector (17.4% of national power production) could be penalized, depending on how the concept of HMWBs is applied.



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Flooding Directive & Management Plan

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Since 1989 In the national law Hydraulic risk

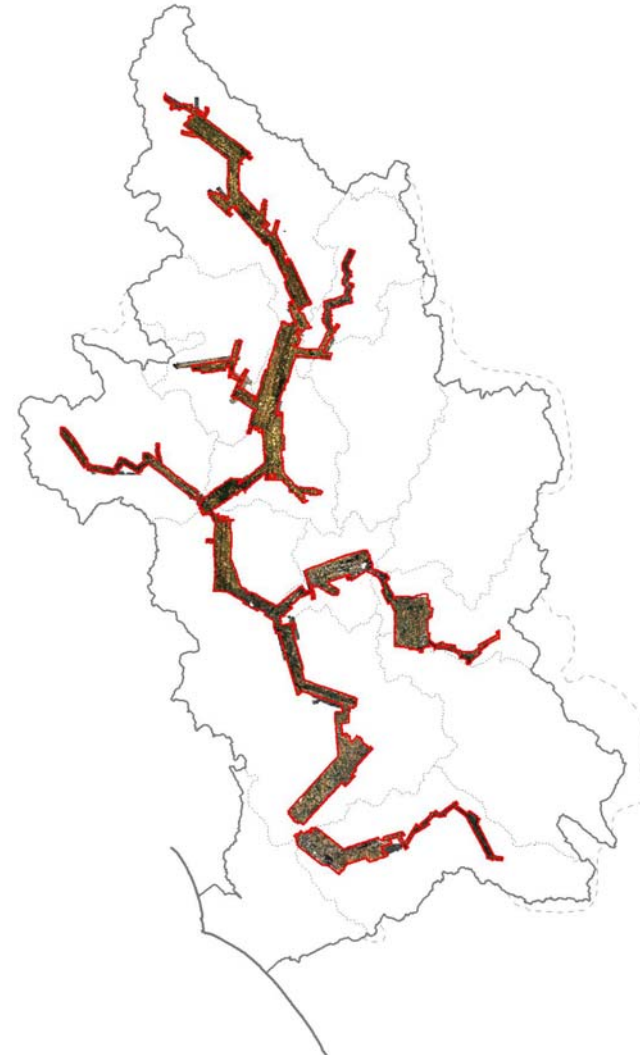
Survey area 1450 km²

1800 river sections with
first-order levelling

Levelling (precision DEM
h=30cm pass 2x2mt)

Multispectrum images
CASI

Air cover ALTM - CASI



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Hydraulic risk



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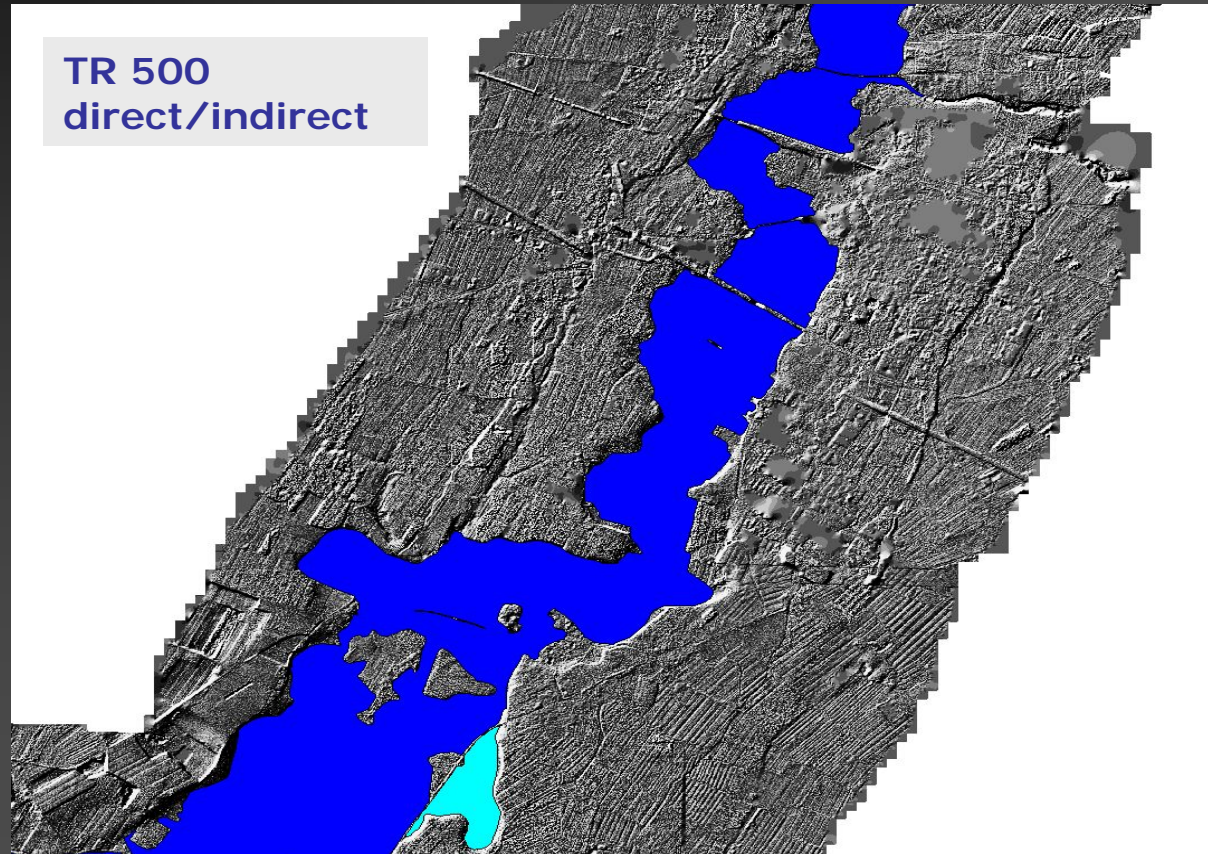


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Hydraulic simulation compared with the digital elevation model

Hydraulic risk



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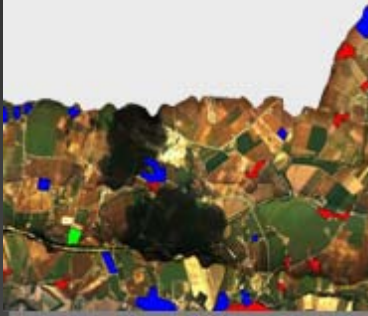
Vulnerability map

Legend

Red = K100

Blu = K 80

Green = K 50



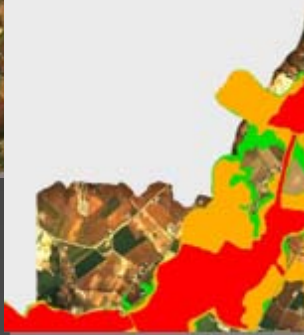
Floodable zones map

Legend

Red = fascia A

Jellow = fascia B

Grren = Fascia C



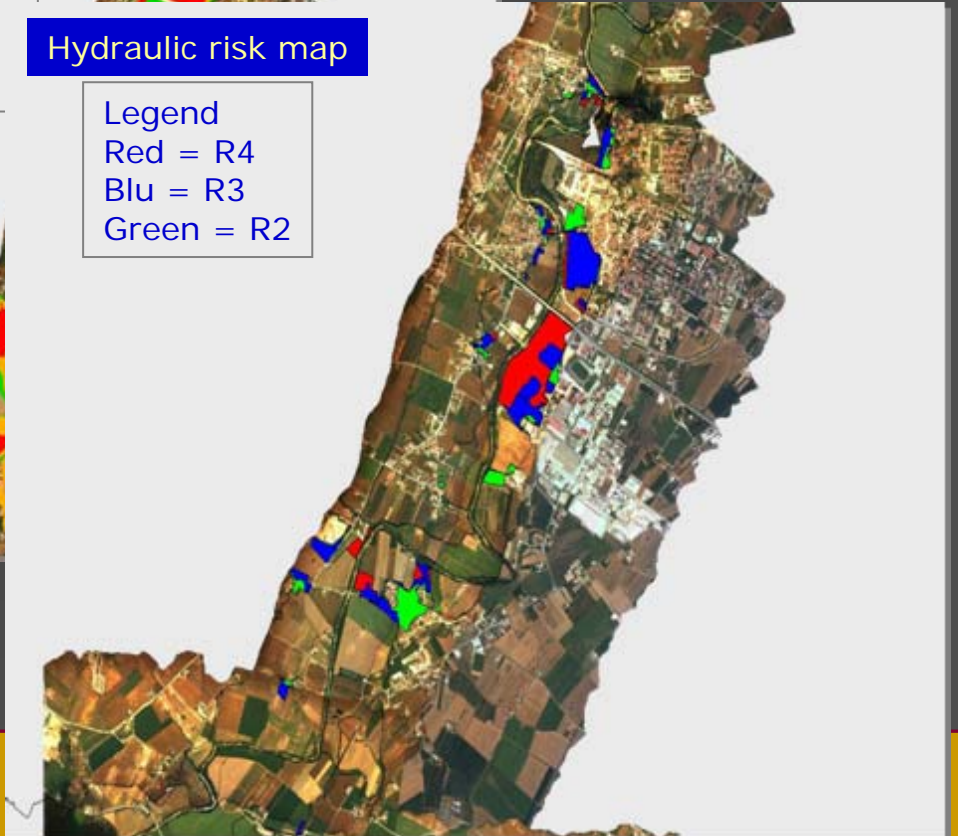
Hydraulic risk map

Legend

Red = R4

Blu = R3

Green = R2



Hydraulic risk



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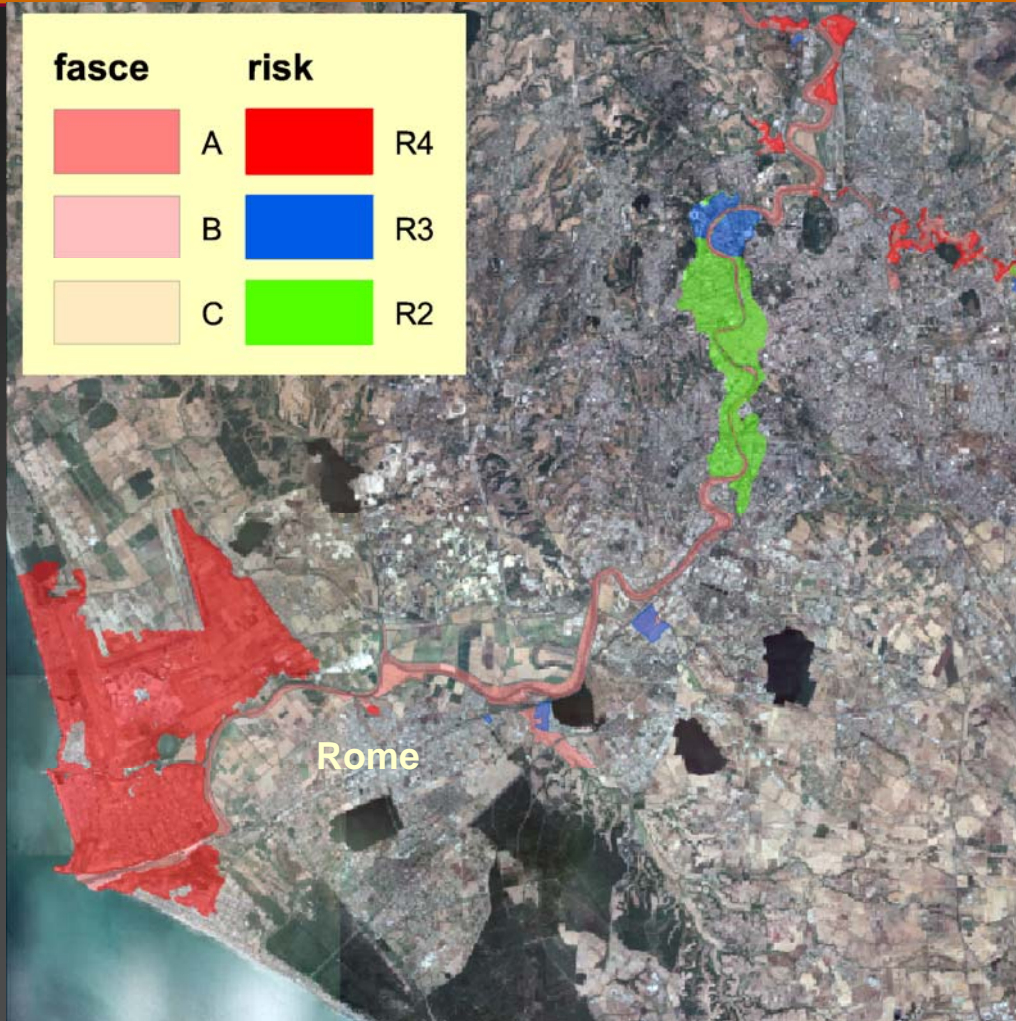


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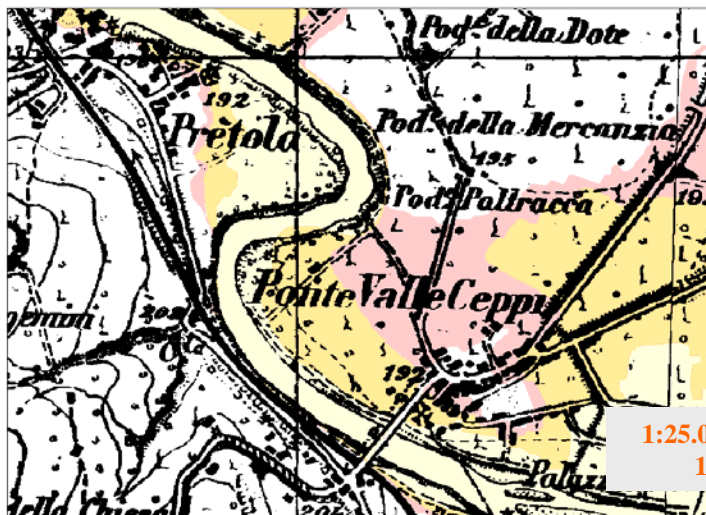
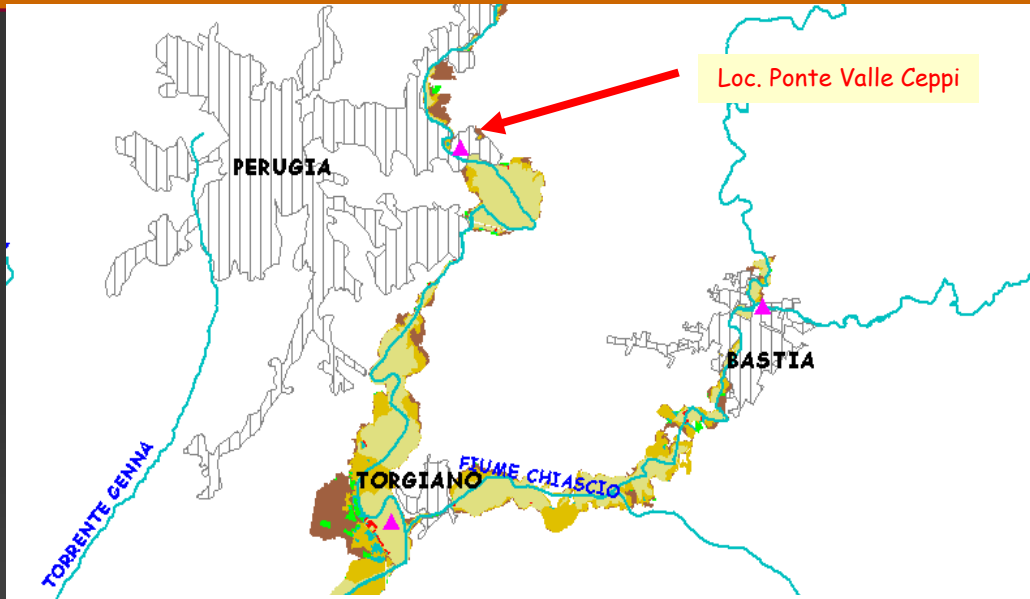
Floodable areas and hydraulic risk in Rome

CRUCIAL ISSUE : WFD & Flooding Directive

ANTHROPIC DYNAMICS

Urban development in floodable areas

Linear infrastructures development in flood plains



1:25.000 IGM
1932



Interaction Flooding mp - WFD mp



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Flooding Plan Measures

mountain

Reforestation

Hydraulic-forest works

Alluvial plain

Defence works

Settlement displacement

Introduction of Fluvial Parks

Risk
factors



Interaction with WFD

Increase of Effective Infiltration
Aquifer recharge

Alteration of the natural
ecosystems

Introduction of HMWB's

Removal of HMWB's

Aquatic ecosystems and Wetlands

Successful implementation of the WFD

It is necessary to develop tools that allow to identify possible deadlocks due to political and institutional factors and participatory processes



Crucial Issue	Hydropower	Agriculture	Water balance	Industry	
Economic Analysis	↓	↓	↓	↓	↓
Partecipation & Social acceptance of the cost recovery	↓ ?	↓ ?	↓ ?	↓ ?	↓ ?



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