

Slizza basin: studies for hydro-geological risk management in a small alpine basin and their consequences or applicability on trans-national planning

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*Methodologies and best practices for
the participation of the stakeholders
involved in flood risk prevention*

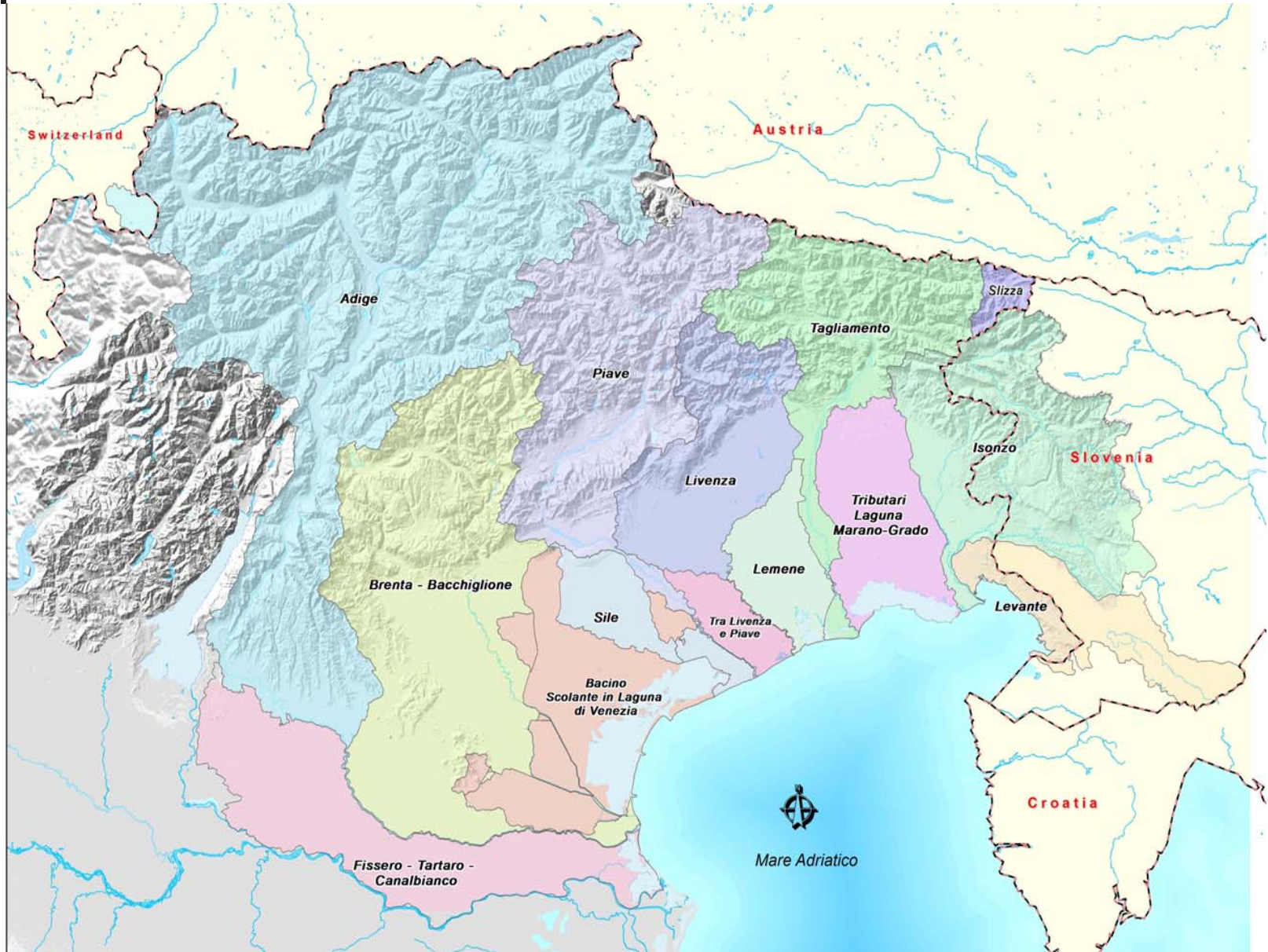
- 1) **Territory**
- 2) **Overview of actors and competences at regional level on soil-water defence**
- 3) **Activities of Regional basin authority FVG**
- 4) **Slizza river (Danube basin): studies and involvement in the transnational context**

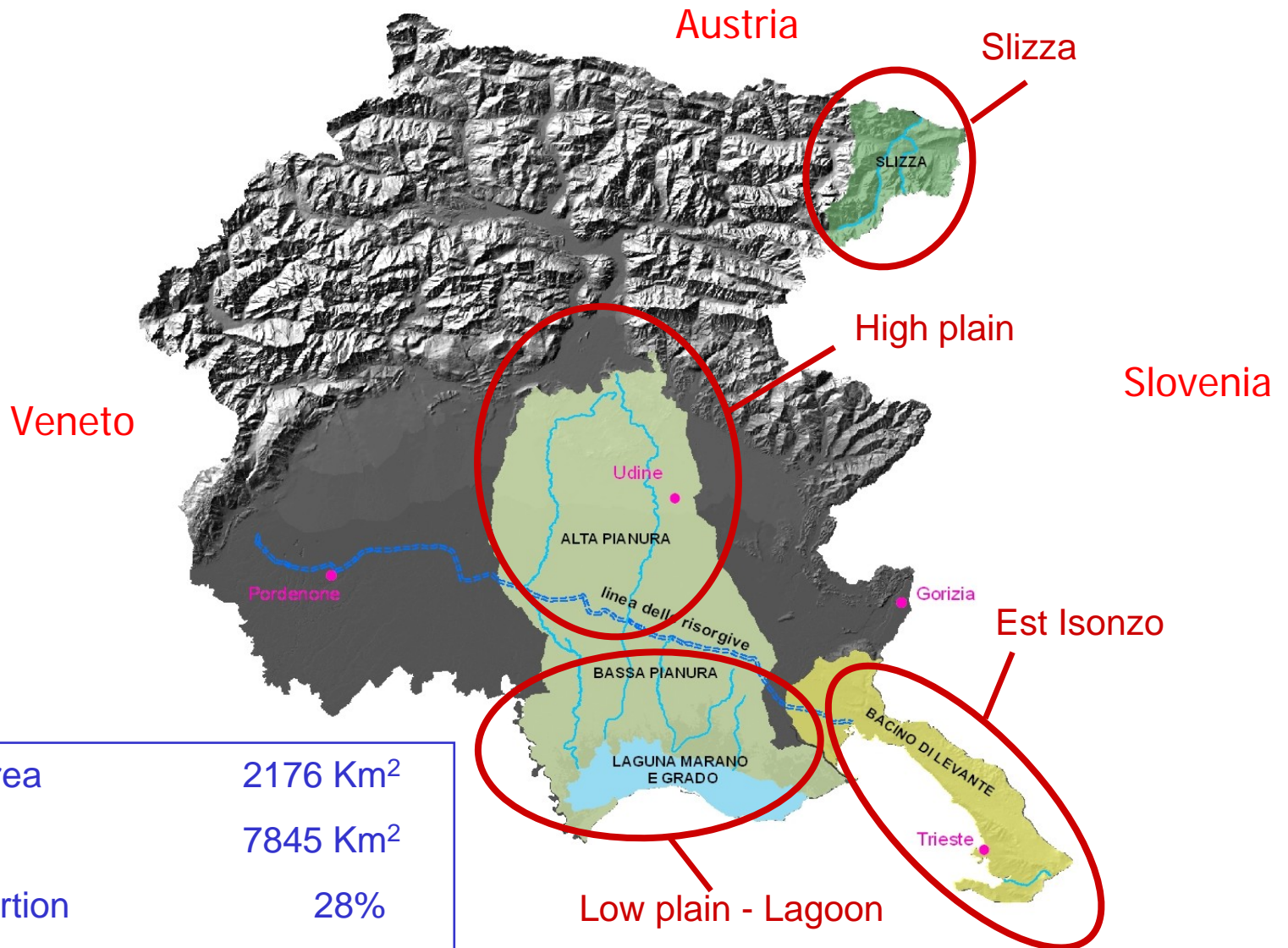
- NATIONAL LAW 183/89 (Basin Authorities, Basin Management Plans)
 - 11 basins under national management
 - 16 basins under interregional management
 - All other basins single region management

- REGIONAL LAW 16/2002 (Institution of Regional Basin Authority, ABR FVG)
 - Operating from november 2004

- NATIONAL LAW 152/2006 (Basins Districts)
 - Transition period, from 2009 ABR FVG under temporary commissary

Region Friuli Venezia Giulia has autonomous law conditions





Competence area	2176 Km ²
Region FVG	7845 Km ²
Regional proportion	28%
Municipalities	75

- 3 GOVERNANCE UNITS
 - COMITATO ISTITUZIONALE (dpr n. 0301/Pres. 8/10/02)
 - COMITATO TECNICO (costituito in data 26/04/2005)
 - SEGRETARIO GENERALE

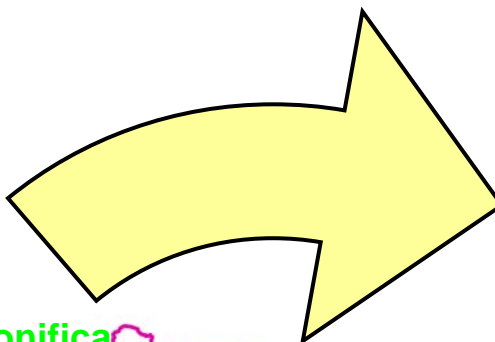
- OPERATING AGENCY (art. 10 LR 16/2002):
 - SEGRETERIA TECNICO OPERATIVA (from 2004)

- JOINING COMMITTEE (art. 11 LR 16/2002):
 - CONSULTA DI BACINO



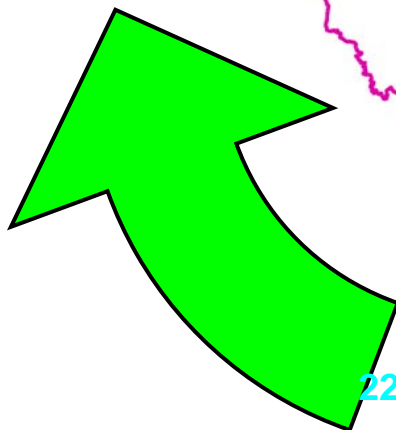
4 Comprensori di bonifica

Cellina - Meduna
Ledra - Tagliamento
Pianura isontina
Bassa friulana



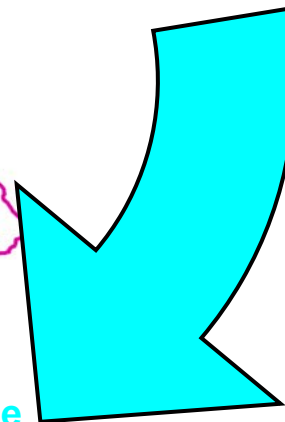
4 ATO regionali

Occidentale
Centrale
Orientale goriziano
Orientale triestino
1 ATO interregionale:
del Lemene



22 bacini di rilievo regionale

2 bacini di rilievo nazionale
(ora Distretto Alpi orientali)



Water/Soil: Coordination and competences

REGIONE:

LR 16/2002: Difesa del suolo e demanio idrico
LR28/2002: Consorzi di bonifica
LR 13/2005: Organizzazione del SII da coordinarsi con il Dlgs 152/2006: Testo unico ambientale

- Programmazione ed indirizzo nell'utilizzo delle risorse idriche
 - Vincolo idrogeologico
 - Elenco acque pubbliche
- Concessione derivazioni da acque pubbliche
- Delimitazione bacini idrografici regionali, comprensori di bonifica, ambiti territoriali ottimali
- Opere idrauliche e di difesa da inondazioni
 - Servizio di piena e pronto intervento idraulico
- Pulizia idraulica e manutenzione
 - PIANO TUTELA ACQUE

Attribuzione di funzioni
(LR 28/2002)

Controllo e coordinamento
(LR 13/2005)

Collaborazione e coordinamento
(LR 16/2002)

Delega:
convenzione tra Comune e Regione
(LR 16/2002)

CONSORZI DI BONIFICA

- Realizzazione/manutenzione opere idrauliche
- Provista/adduzione acque destinate ad usi agricoli
 - Distribuzione irrigua
 - Bonifica idraulica
- Servizio di piena e pronto intervento
- PIANO GENERALE DI BONIFICA COMPRESORIALE

AUTORITA' D'AMBITO

- Organizzazione e gestione del Servizio idrico integrato
- Ricognizione opere esistenti di adduzione, distribuzione, fognatura, depurazione
 - Controllo gestione e qualità del SII
- PIANO TERRITORIALE D'AMBITO

AUTORITA' DI BACINO REGIONALE

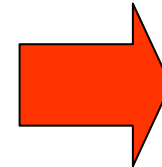
- Safeguard and mantaining of water balance (Respect of DMV; assessment on water supply)
 - Hydrogeological balance
- Management on flood and landslide hazard
- PIANI DI BACINO (hydraulic defence; PAI)

COMUNI : tratte corsi d'acqua interne ai centri abitati

- Pulizia idraulica (asporto di rifiuti, piante, arbusti ecc)
- Manutenzione ordinaria di argini, parapetti, opere idrauliche
 - Pulizia argini e pertinenze fluviali
- Recepimento nei PIANI URBANISTICI COMUNALI di indirizzi vincoli imposti da piani o altri strumenti sovraordinati

HYDRAULIC DEFENCE

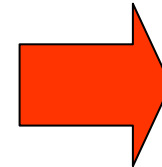
1. Piano stralcio per la difesa idraulica del torrente Cormor (approved, 2009).
2. Piano stralcio per la difesa idraulica del torrente Corno (adottato, 2010)
3. Piano stralcio per la difesa idraulica del torrente Slizza (work in progress)



Definition of plans and actions based on TR = 200 anni

HYDROGEOLOGICAL RISK MANAGEMENT

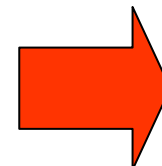
Progetto di Piano stralcio per l'assetto idrogeologico, PAI (in study)



- Hazard maps (H1-H4);
- achievement of 2007/60/CE objectives

TUTELA ECOLOGICA E AMBIENTALE

Progetto di Piano stralcio per la difesa idraulica e la tutela ecologica ed ambientale della Laguna di Marano e Grado (in study)



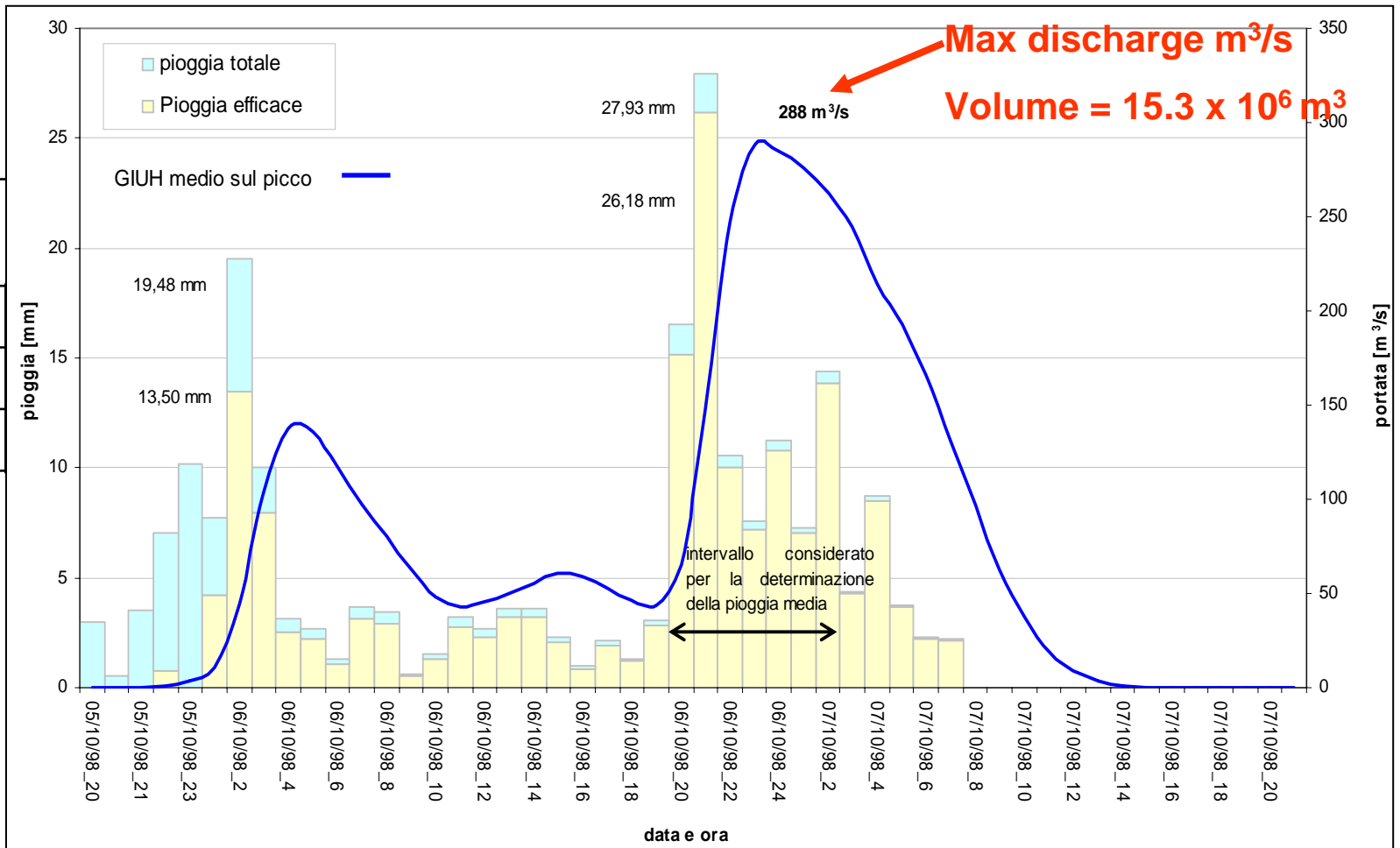
- bathymetric map, circulation hydraulic model;
- morphological and ecological protection of lagoon environment

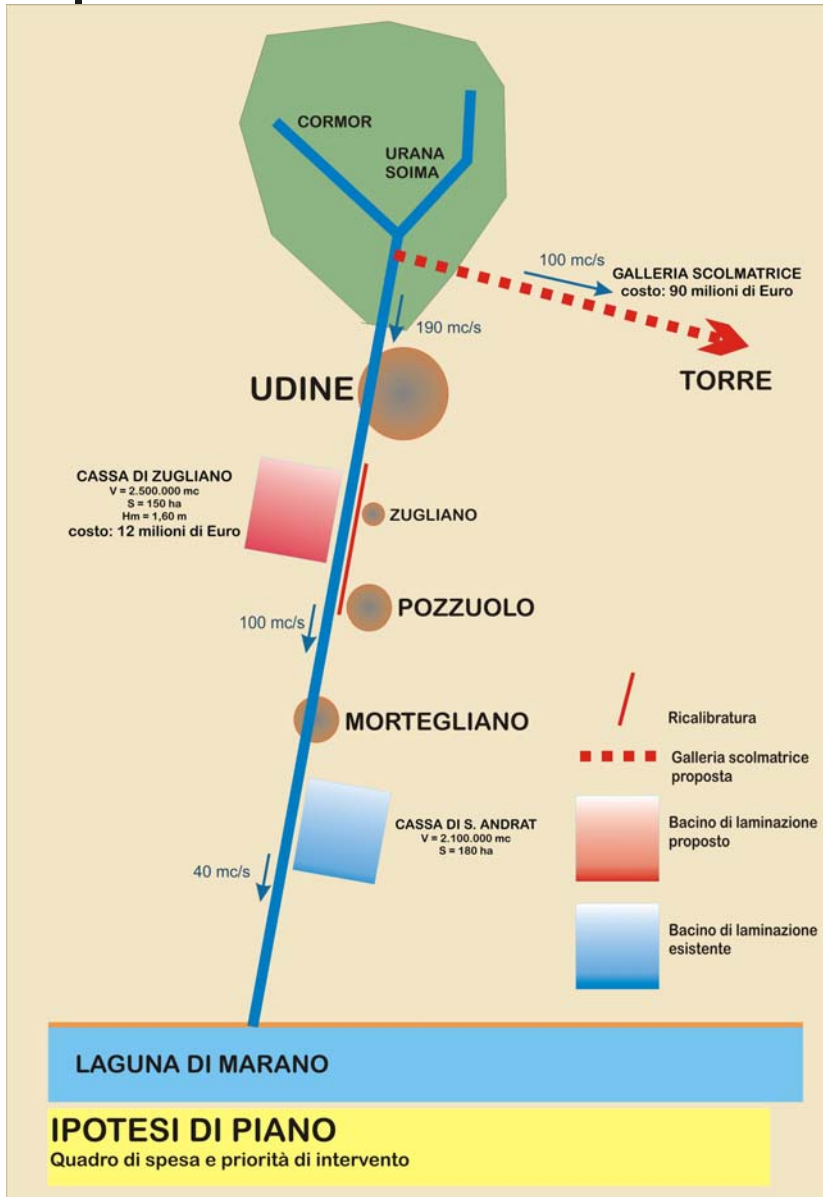


- Flood towards plain from hill territory of 80-90 km²;
- High plain with riverbed large channel;
- Low plain riverbed completely between artificial levee (land reclamation 1930-1960);
- Few possibilities for operating in low plain (urbanization, infrastructures)

Reference flood for operations planning $T_r=200$ anni

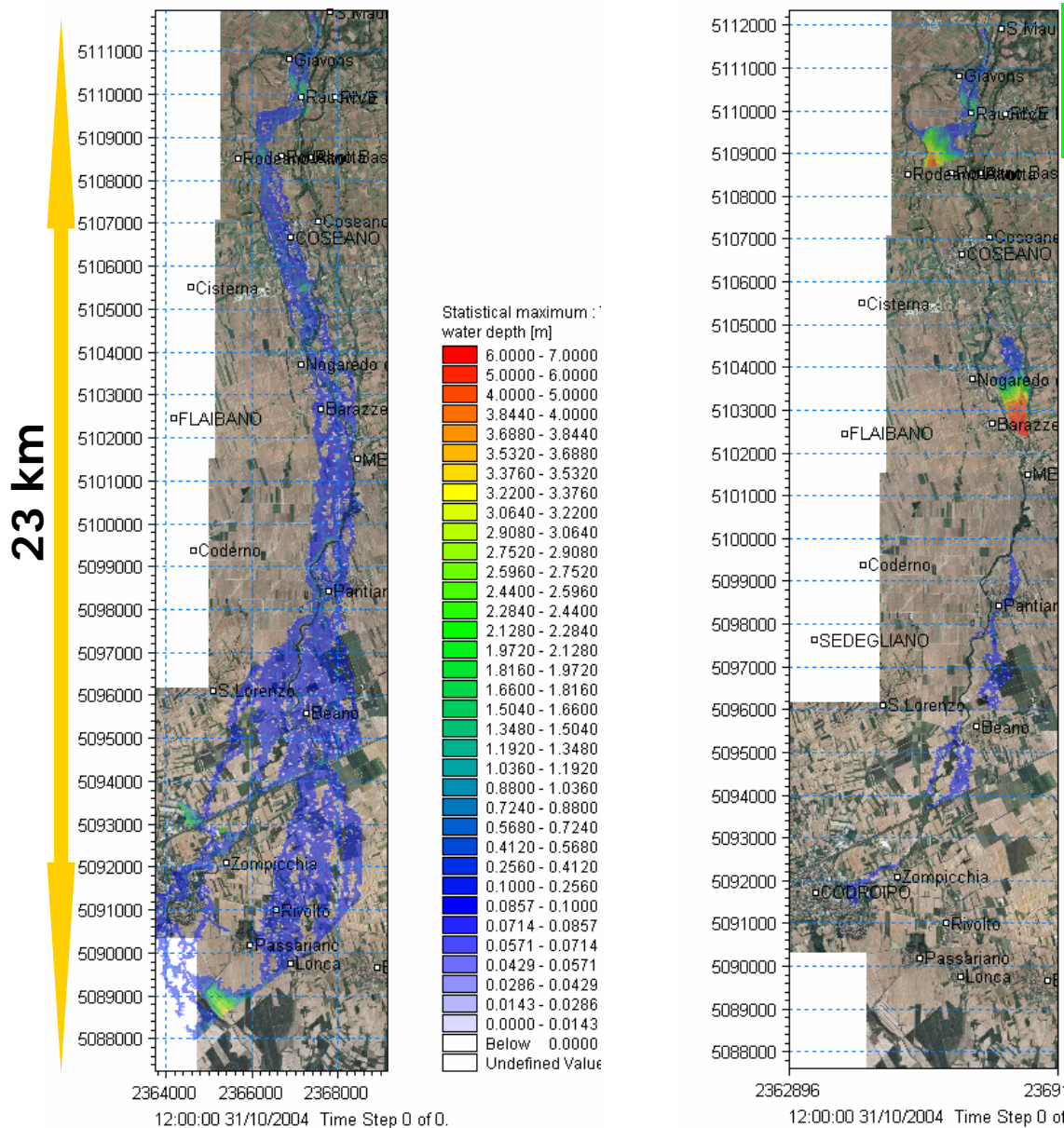
Reference flood was calculated with Geomorphoclimatic Istantaneous Unit Hydrograph₁





Technical solutions and planned works

- Diversion tunnel towards Torre river (Isonzo basin), max discharge = 100 m³/s
- Rimodeling of flood detention area of Sant'Andrat
- New flood detention area near Zugliano
- Plan management introduce also rule and constraints in land use, definition of “riverine zones”. Obligation for municipalities to develop actions following hydraulic invariance concepts in urbanized areas.



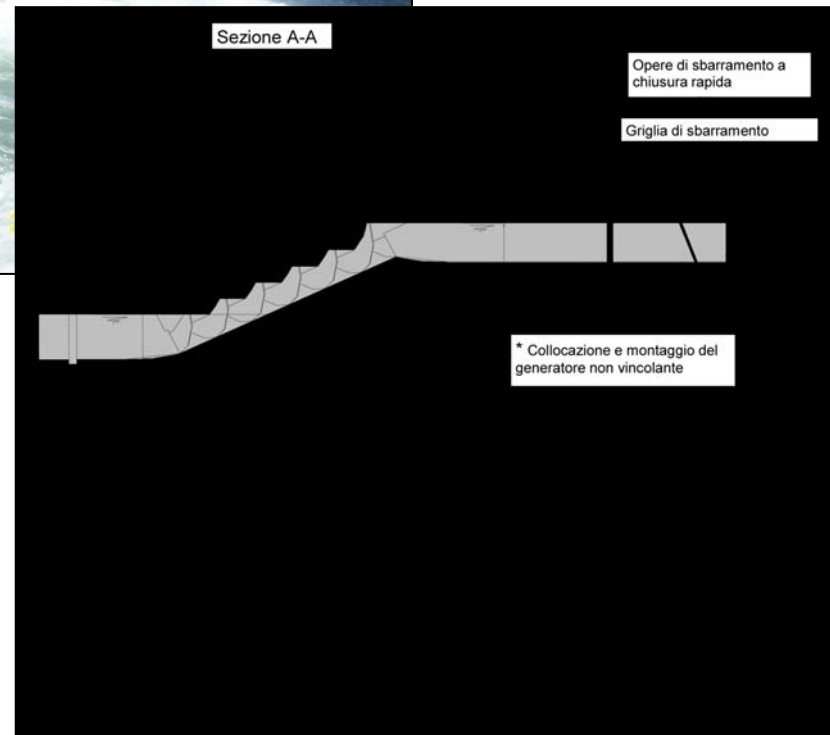
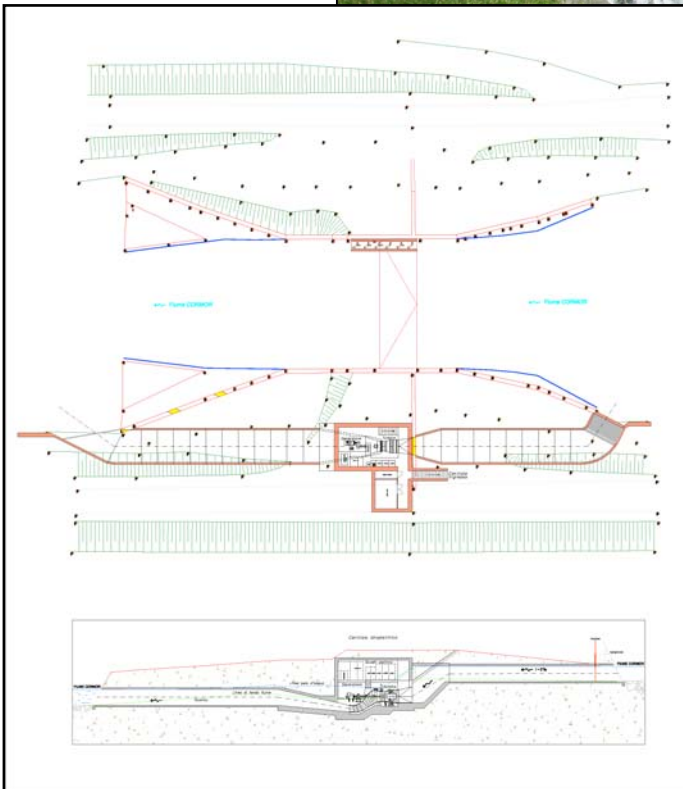
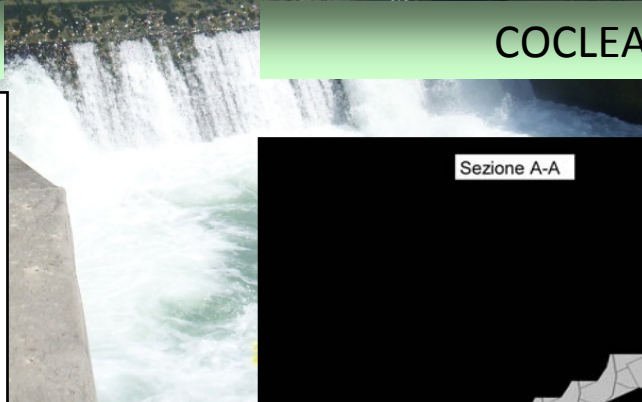
Common instruments and methodologies

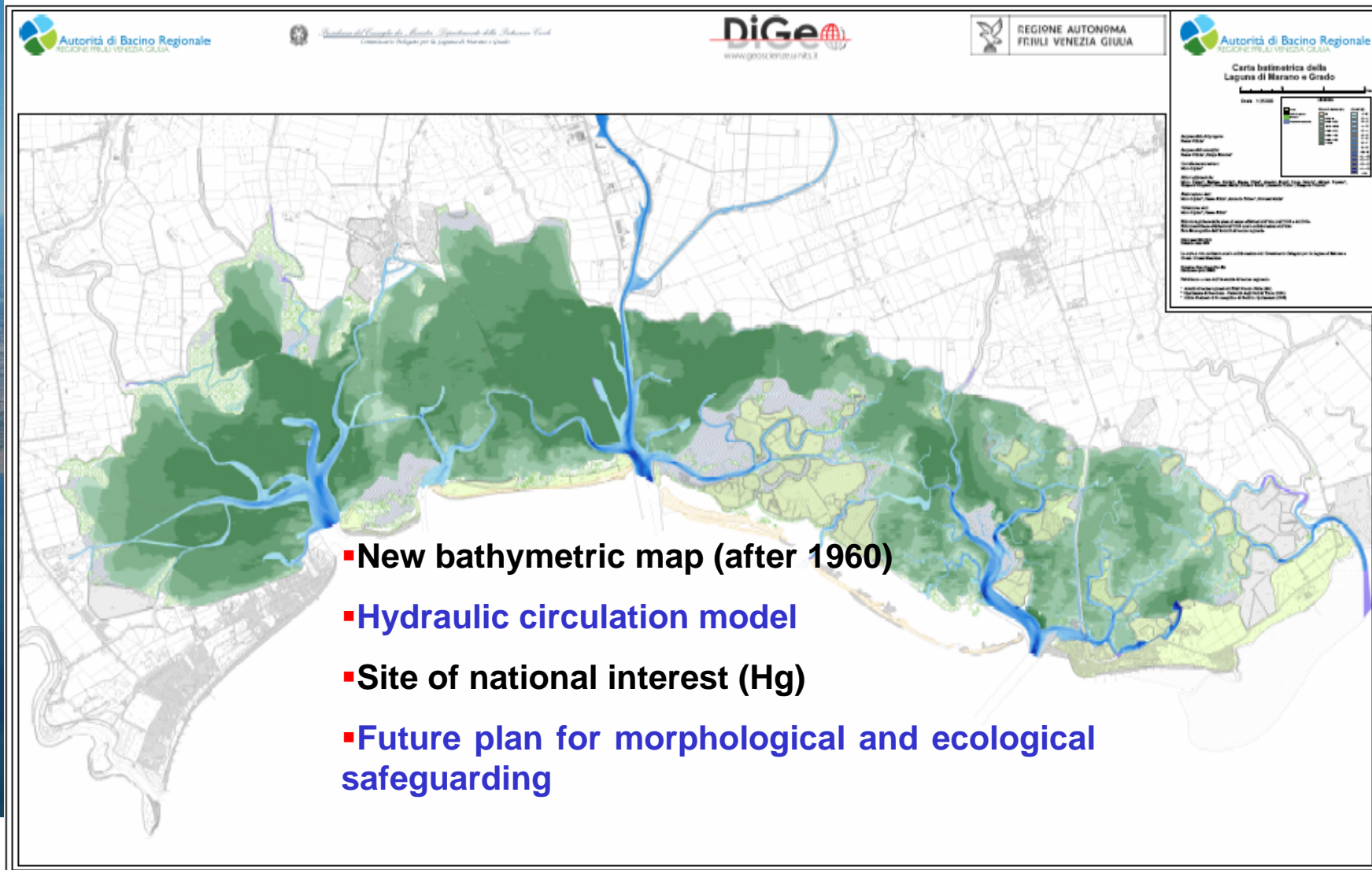
- **GIUH and SCS-CN**
- **MIKE FLOOD (MONO AND BI-DIMENSIONAL)**
- **LIDAR DATA FOR DTM**
- **DISCHARGE (ADCP instruments) AND LEVEL MONITORING (RECENT)**



KAPLAN TURBINE

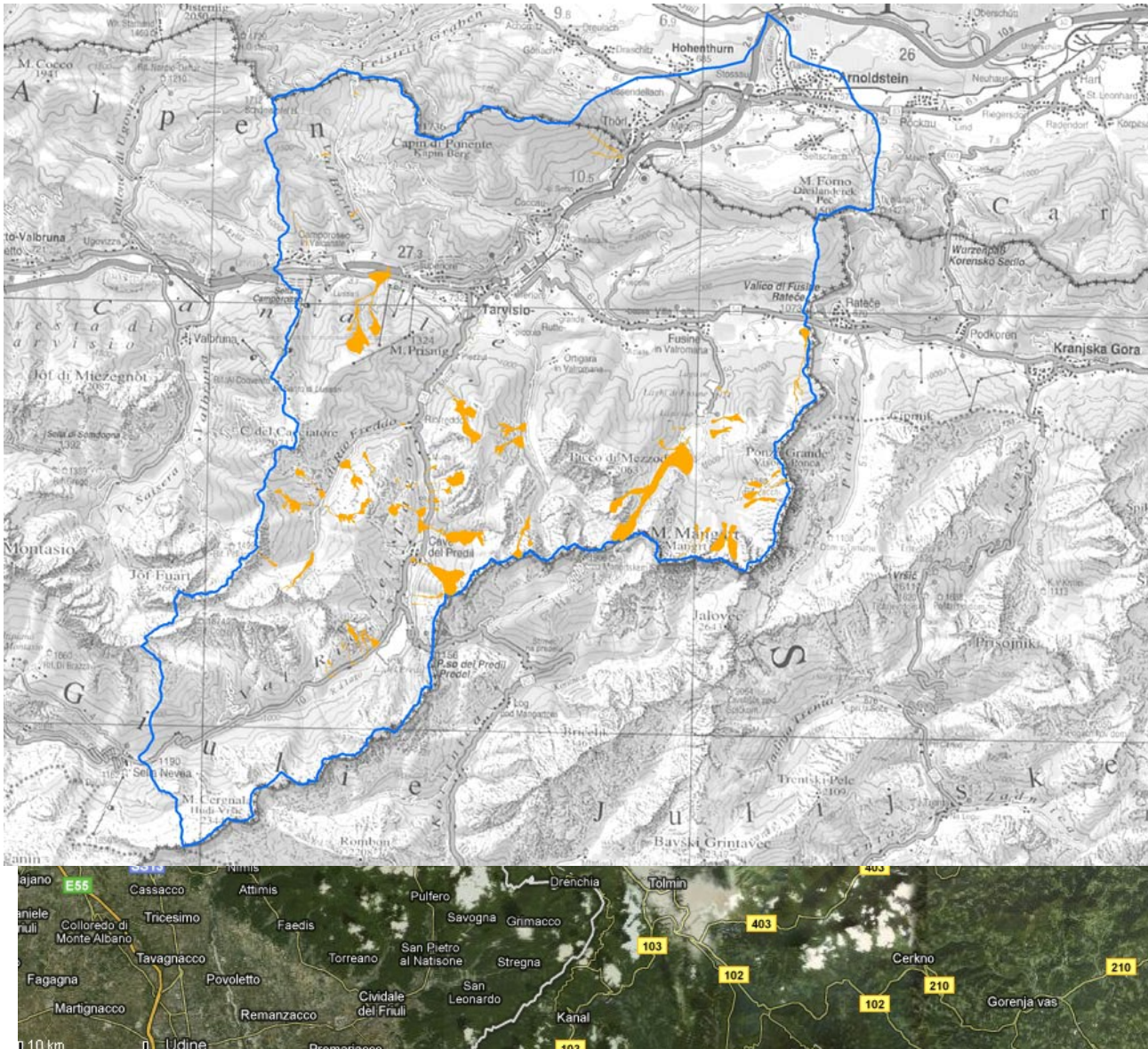
COCLEA (SCREW)





- New bathymetric map (after 1960)
- Hydraulic circulation model
- Site of national interest (Hg)
- Future plan for morphological and ecological safeguarding

SLIZZA BASIN – General context



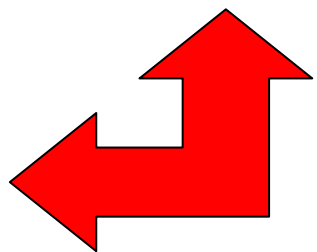
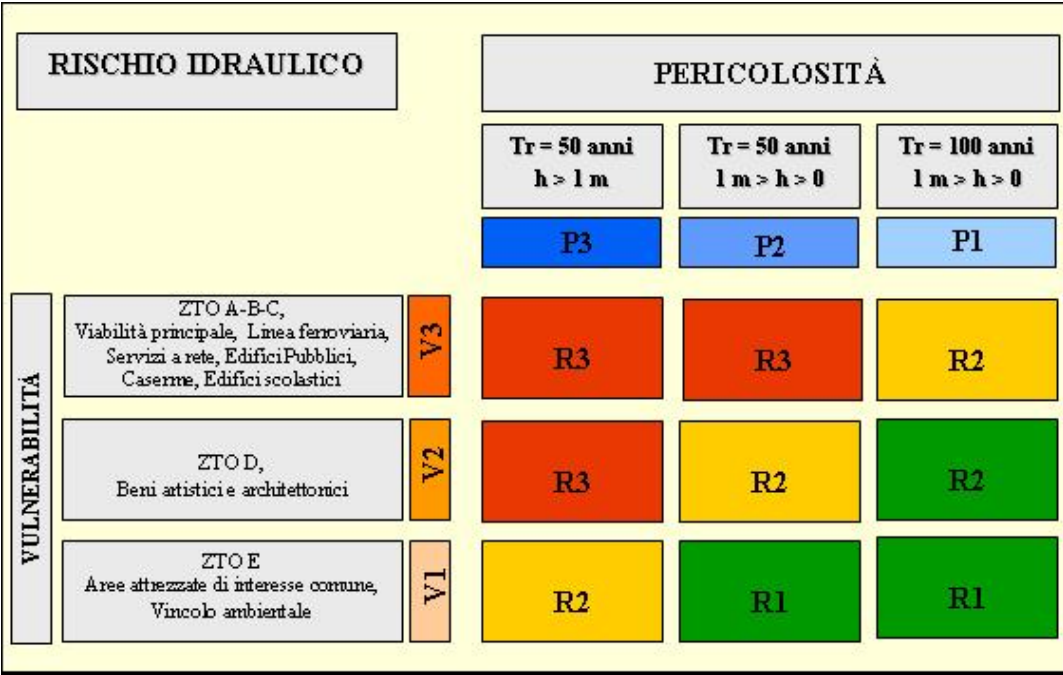
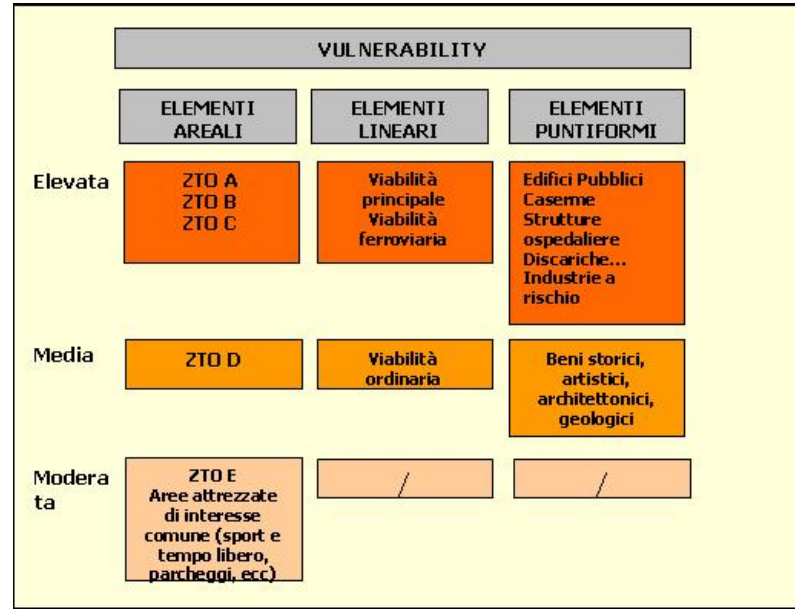
- Slizza > Gailitz > Gail > Drava (Drau) > Danube
- H max 2677m, H min 600m
- 180 km²
- Main branch 30 km

TOPICS

- 1) PAI – Hazard mapping for landslides and floods
- 2) Transnational involvement – Cave Predil case
- 3) Transnational cooperation – Floodrisk: need of shared approaches/practices/informations
- 4) DMV and water withdrawal for hydropower

GENERAL CONSIDERATIONS FOR NE ALPINE BASINS

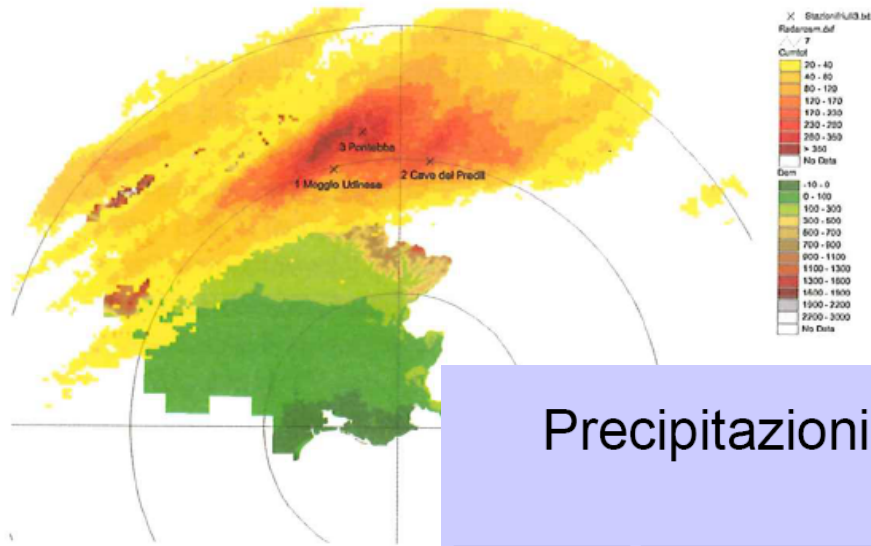
- 1) Major problems (es. victims) comes from Debris Flow phenomena
- 2) During last years episodes of flood due to rainfall and snowmelting (especially in december)
- 3) Need of specific hydraulic modeling (snowmelting, real time models, rapid alerting systems)
- 4) Increasing of water request for hydropower



... to be revisited
(2007/60/CE, DLGS 49/2010)

Radar di Fossalon di Grado

29/08/2003 pioggia cumulata ore 09-21



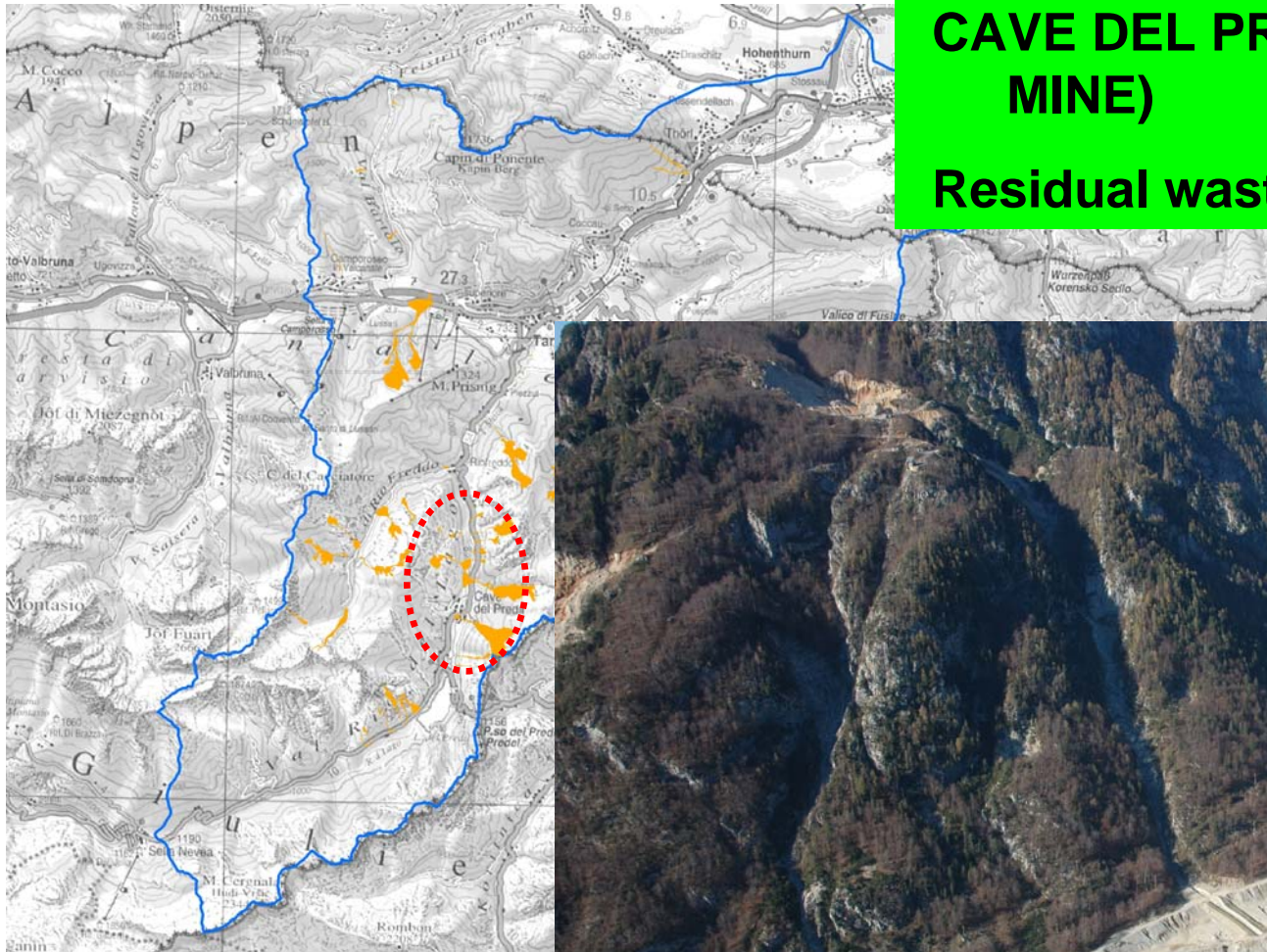
29.08.2003

- Val Canale (Pontebba, Malborghetto, Tarvisio municipalities)
- Strong rainfall event in 12 hours, tens of debris flow from small basins (< 1-2 Km²)
- 400 landslides, 2 victims

Precipitazioni massime dell'evento del 29.8.2003

STAZIONE PLUVIOMETRICA	fase precedente dell'evento 4 ore dalle ore 10 alle 14 del 29/8	fase critica dell'evento 4 ore dalle ore 14 alle 18 del 29/8	coda dell'evento 4 ore dalle ore 18 alle 22 del 29/8	massime intensità di precipitazione finora registrate presso le stazioni per il periodo di 3 ore consecutive	massime intensità di precipitazione finora registrate presso le stazioni per il periodo di 6 ore consecutive
CAVE DEL PREDIL	24.2	17.0	96.0	90,6 il 16/9/1968	119,8 il 7/9/1962
TARVISIO	17.6	59.6	38.4	66,0 il 16/6/1946	95,6 il 15/7/1970
PONTEBBA	51.0	293.0	45.6	155,0 il 22/6/1996	199,0 il 22/6/1996
S.P. PER PASSO PRAMOLLO (GALLERIA)	43.8	242.6	46.8	nessuna serie storica	nessuna serie storica
CHIOUT	42.6	67.6	40.0	nessuna serie storica	nessuna serie storica
CORITIS	19.2	4.8	59.4	231,0 il 21/8/1969	309,4 il 21/8/1969
S. GIORGIO DI RESIA	12.6	11.6	45.6	148,8 il 21/8/1969	246,2 il 6/9/1961
RESIUTTA B.GO POVICI	30.2	33.2	19.6	nessuna serie storica	nessuna serie storica
RACCOLANA DI CHIUSAFORTE	17.0	22.2	31.4	nessuna serie storica	nessuna serie storica
SALETTO DI RACCOLANA	12.0	10.2	41.4	nessuna serie storica	nessuna serie storica
MOGGIO UDINESE PONTE SU F. FELLA	42.2	65.2	20.0	228,4 il 22/6/1996	314,2 il 22/6/1996





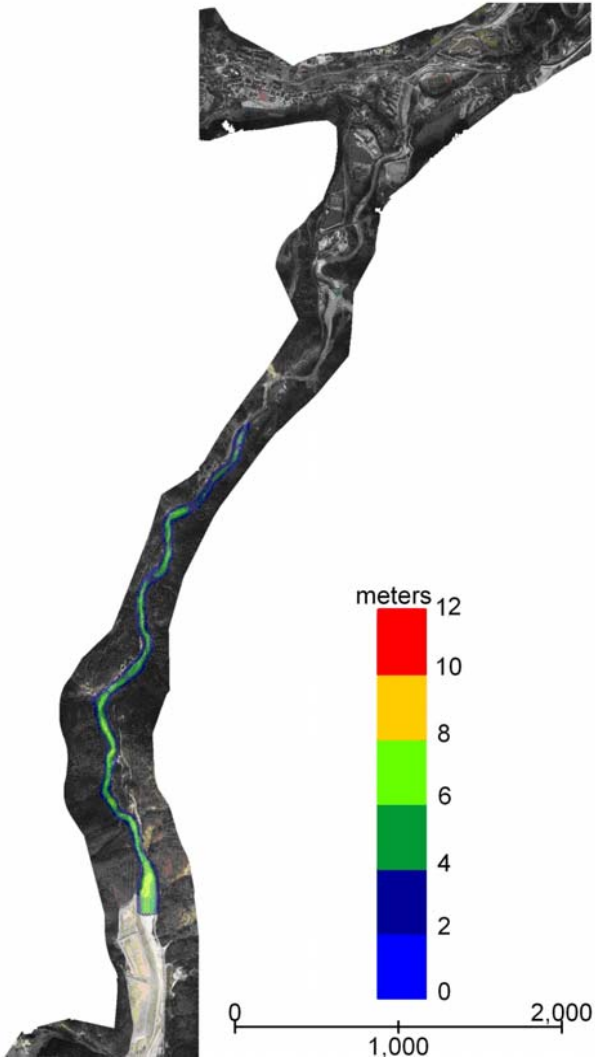
CAVE DEL PREDIL (Pb,Fe, Zn MINE)

Residual waste sediments ~2M m³

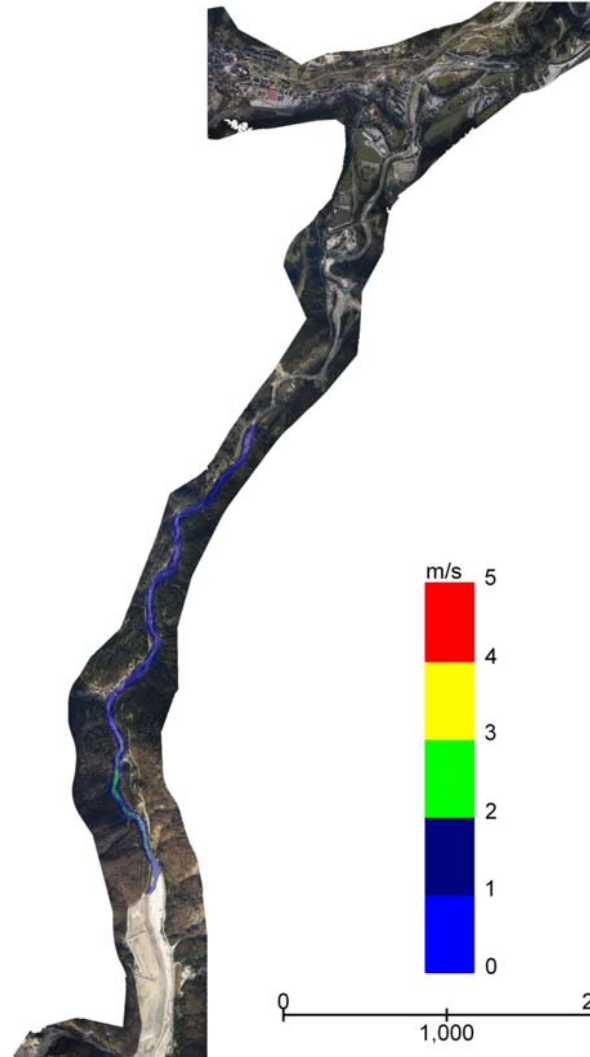




Grid Element Maximum Flow Depth



Grid Element Maximum Velocity



Debris flow from hypotetical dam break :

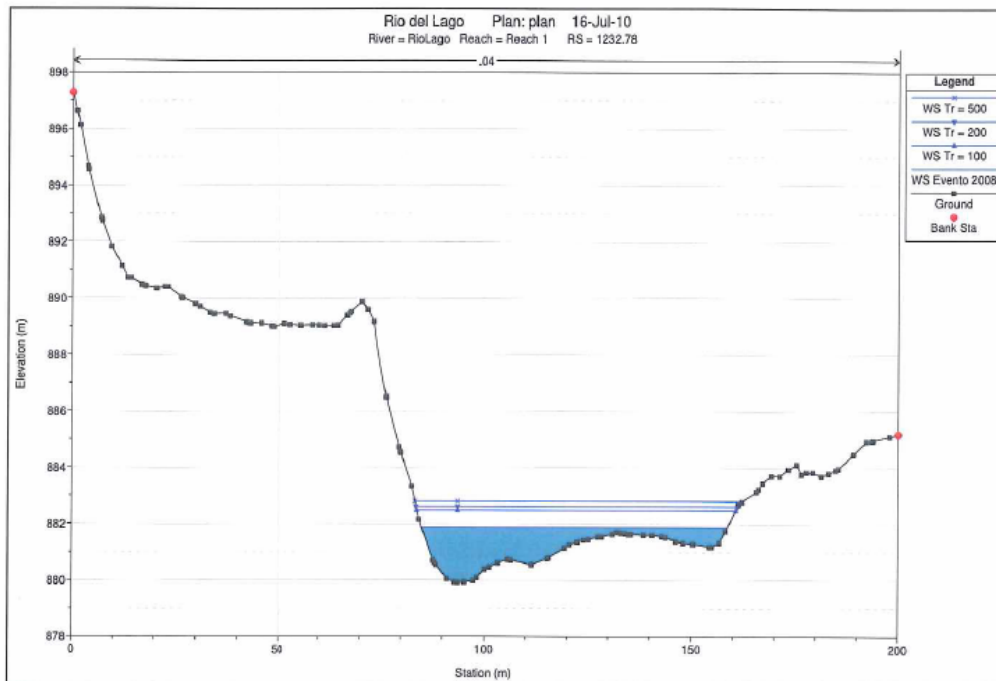
- Collapse volume hypothesized (stability analysis partially made but difficult)
- Slizza river runs next to waste storage basins – disponibilità di acqua per la formazione della colata detritica
- Debris Flow modeling with FLO-2D

3 APPROACHES on Cave del Predil specific case

- 1) GIUH and SCS-CN , ABR FVG
- 2) TOPMODEL (TOPography based hydrological MODEL), UNITS
- 3) Conceptual model based on HEC-HMS approach, UNIUD

Different results

Es. TR 200 years (250-350 mc/s)



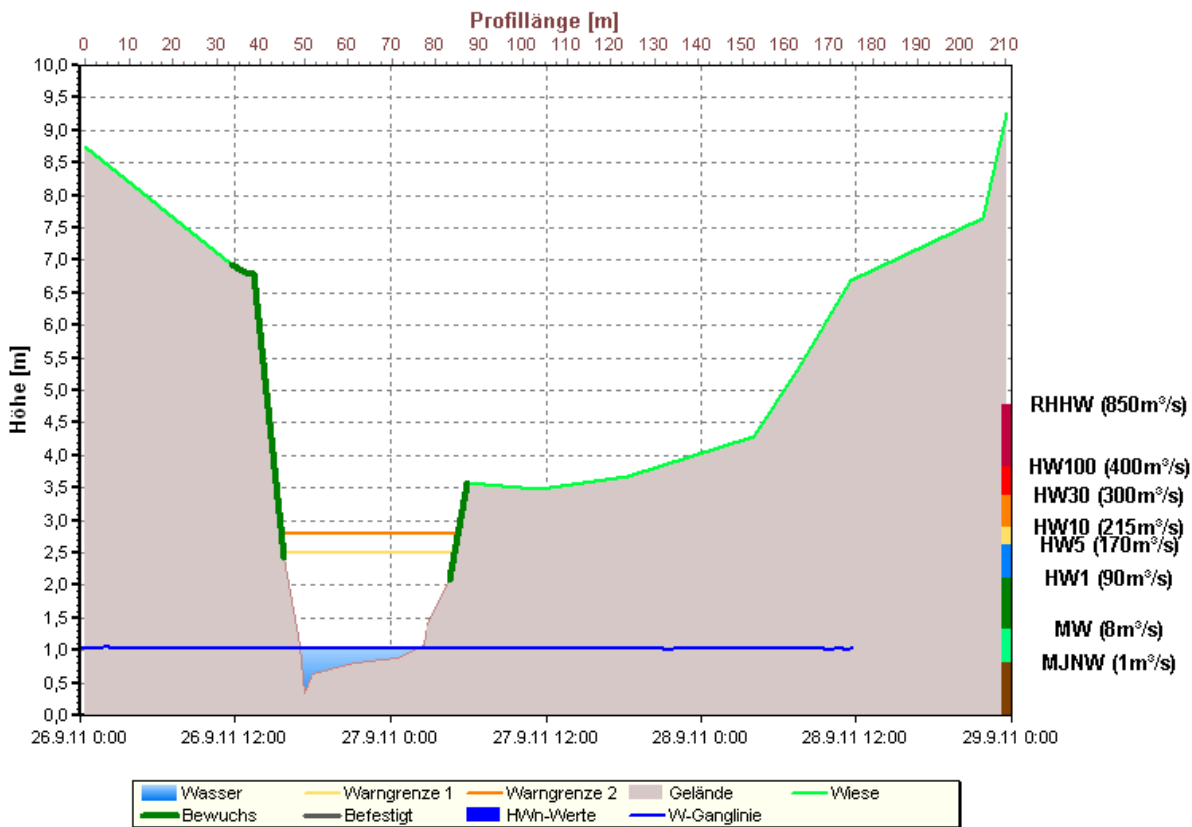
..TOWARDS A SOLUTION AFTER 20 YEARS FOR POLLUTION, FLOOD AND MUD FLOW RISK

Important financing (5-6 M euro) will enable works for hydrogeological and pollution safeguarding:

- by pass for waterflow from slopes
- Enhancement and rise of riprap (pali secanti)
- Overlay of deposits with clay layer

Fig. 10: Piena del Rio del Lago fotografata in data 25.12.2009.

Querprofil Messstation Thörl - Gallitz



Letzte Messung: 28.9.11 11:45 MEZ W = 102 cm Q ~ 2,5 m³/s Achtung: Ungeprüfte Rohdaten!

HydroMap

Historical discharge series from Thörl station (start 1975)

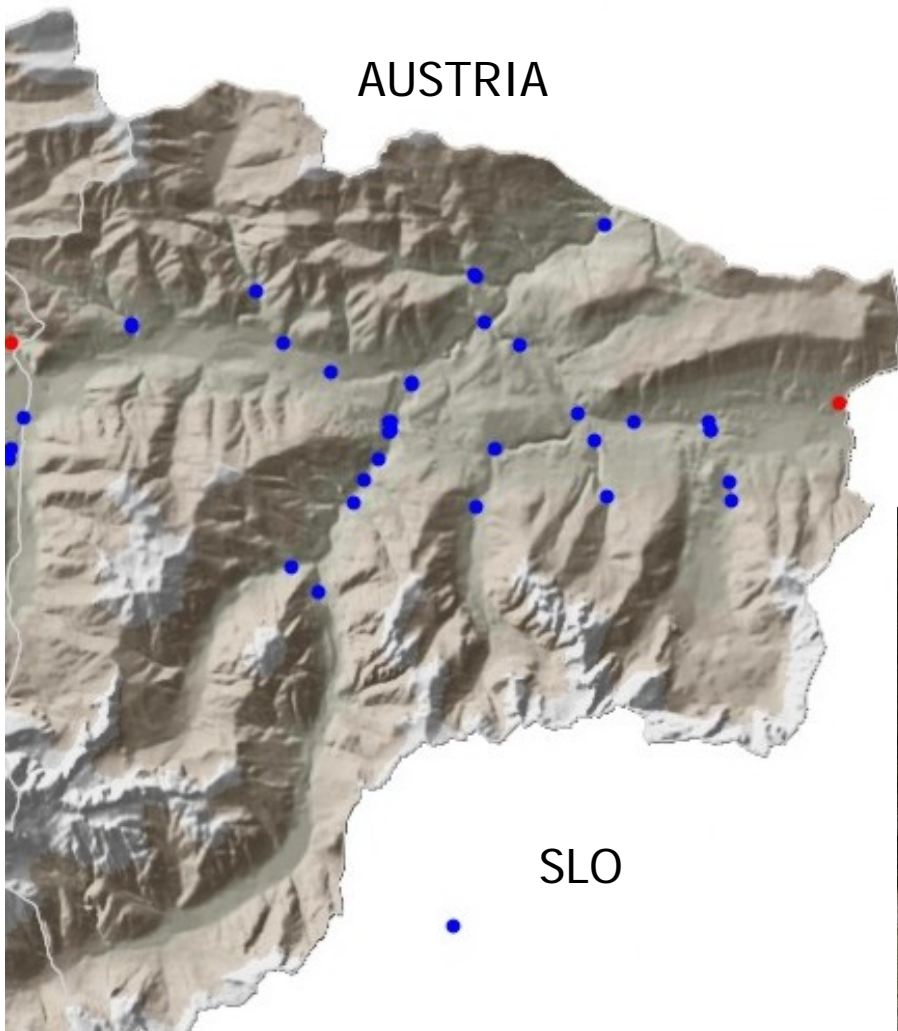
Transnational cooperation would be fundamental for:

- **Monitoring**
- **Models calibration**
- **Real time modeling**
- **Alert/alarm thresholds and systems**
- **Risk analysis and scenario (common strategies and approaches)**

QUANTIFLOOD project (OJ C 49 of 16/2/2011, Projects on prevention and preparedness)

MASSMOVE project, Minimal standards for compilation of danger maps like landslides and rock fall as a tool for disaster prevention (Interreg IV)

Increasing of request for small hydropower stations



DMV (Deflusso minimo vitale):

- Regional Law 28/2001 – definition of DMV as 4 l/s/km² (intention of temporary act);
- From 2007 resolution of ABR – adoption of a modified swiss method (Q₃₄₇);
- Legal action of private companies;



THANK YOU FOR ATTENTION