



# Riparian vegetation management along the Secchia river (northern Italy)

Experimenting sustainable management practices

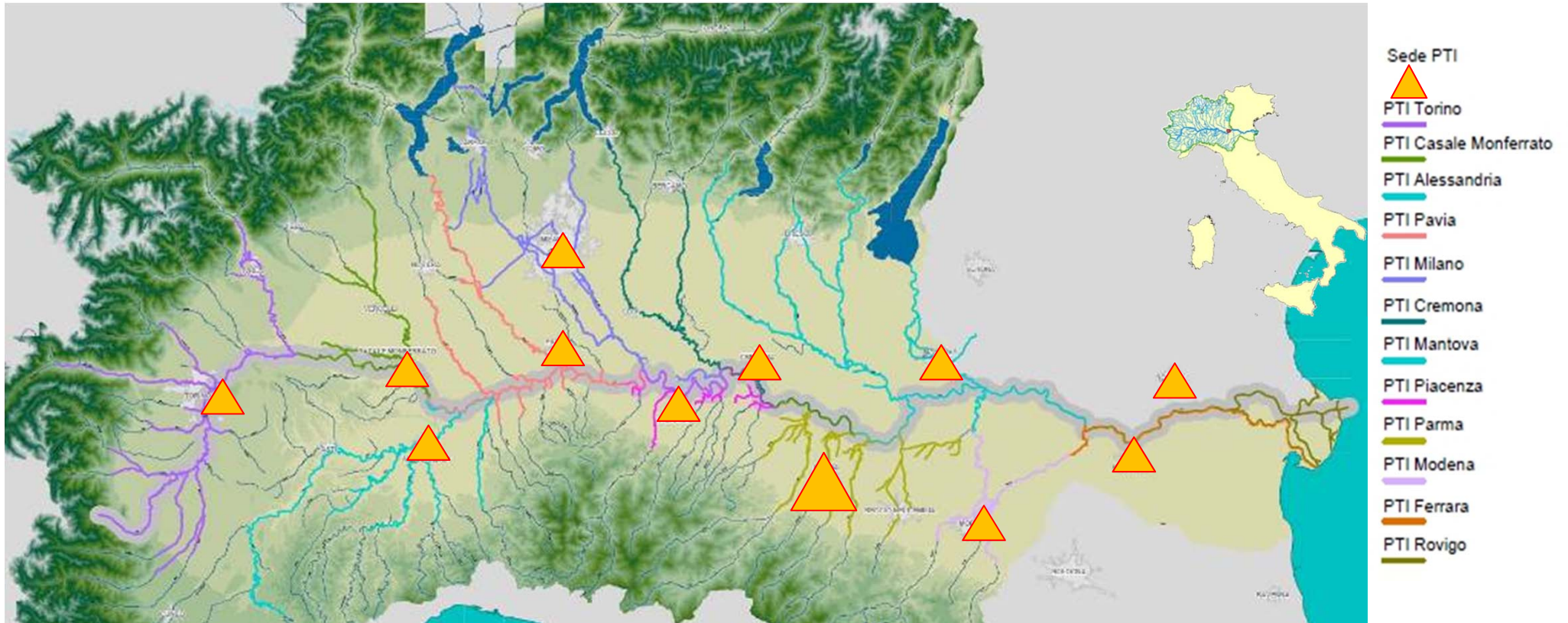
F. Filippi, PG. Bensi, S. Pavan, F. Pellegrini and L. Petrella

THIRD INTERNATIONAL CONFERENCE ON  
WOOD IN WORLD RIVERS 2015

University of Padova  
ITALY July 6-10, 2015

- Operative implementation of flood protection for the assigned river reaches in the Po river basin
- Control and management of the state property fluvial areas
- Flood monitoring and emergency response during flood events
- Navigation works along the Po river and Regional waterways management

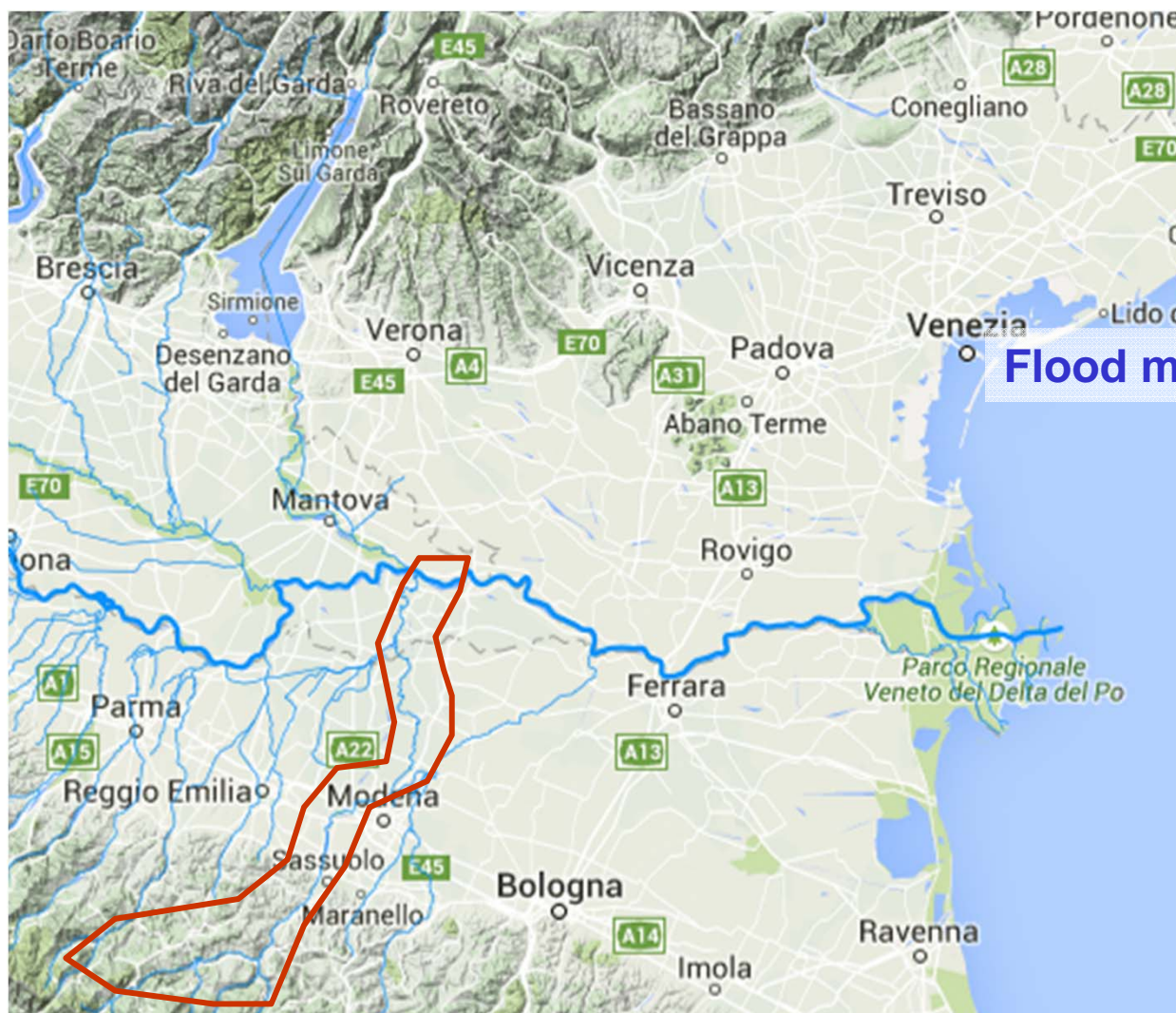
Region	Length of river reaches [km]	Length of levees [km]
<b>Piedmont</b>	1218	587
<b>Lombardy</b>	1689	1218
<b>Emilia Romagna</b>	759	1138
<b>Veneto</b>	188	380
<b>Total</b>	<b>3855</b>	<b>3323</b>





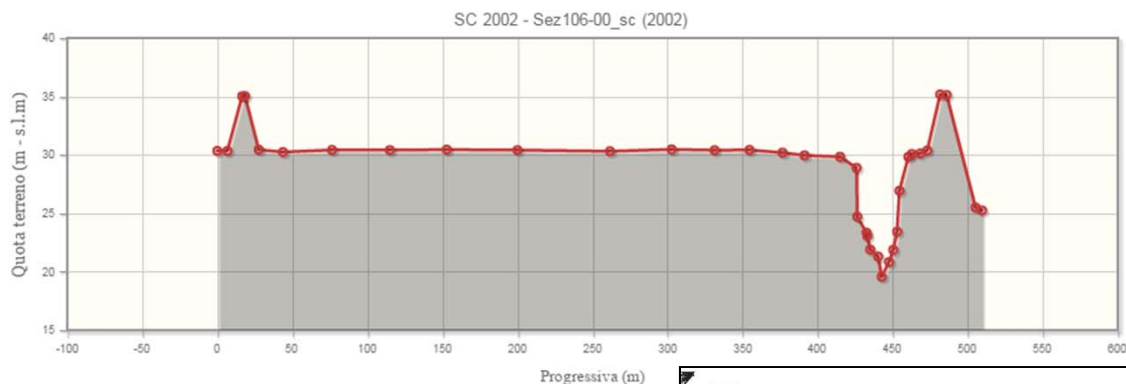
## River Secchia: where is it?

Flows from South to North, across three Provinces (Reggio Emilia, Modena and Mantua) and two Regions (Emilia Romagna and Lombardy).





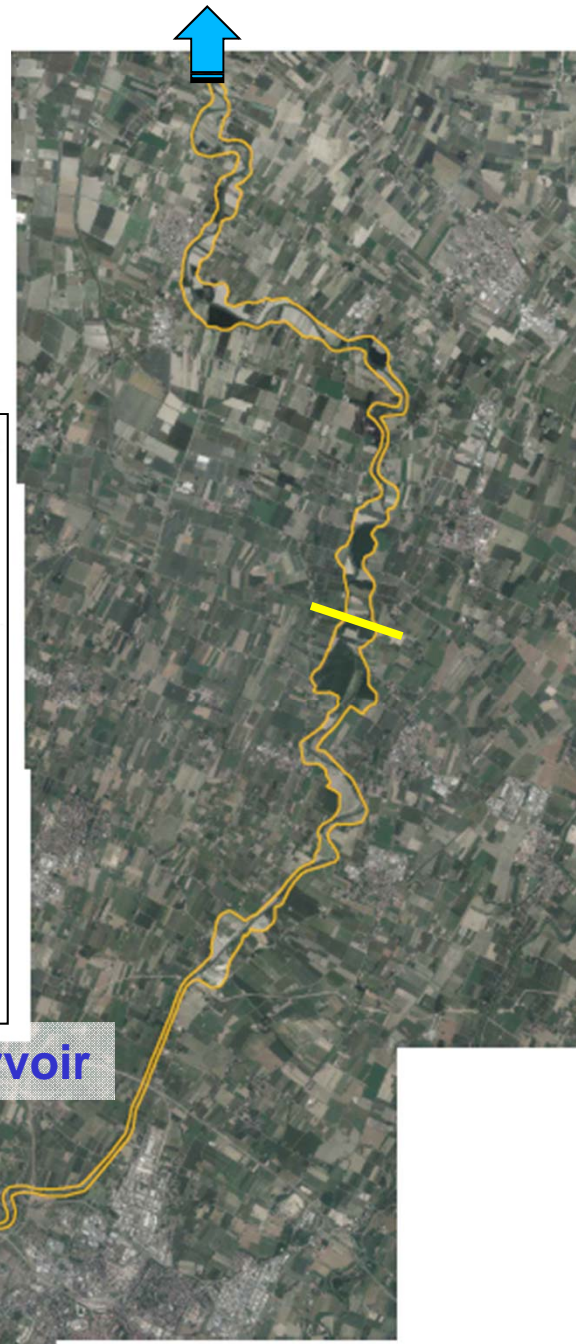
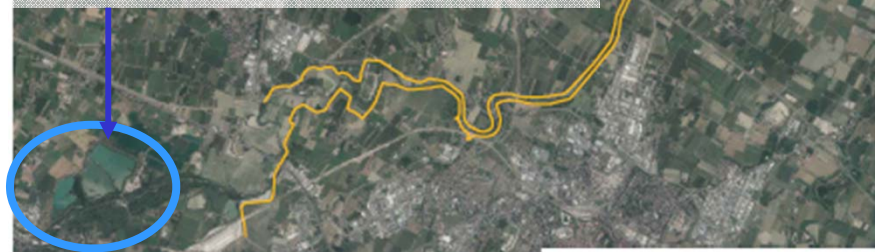
# The levees



River Secchia's levees starts shortly downstream the flood mitigation reservoir, located at the closure section of the mountain basin. Some reaches date up to 1700, and run sometimes very close to the river channel, sometimes quite far, bounding wide overbank areas almost completely cultivated.

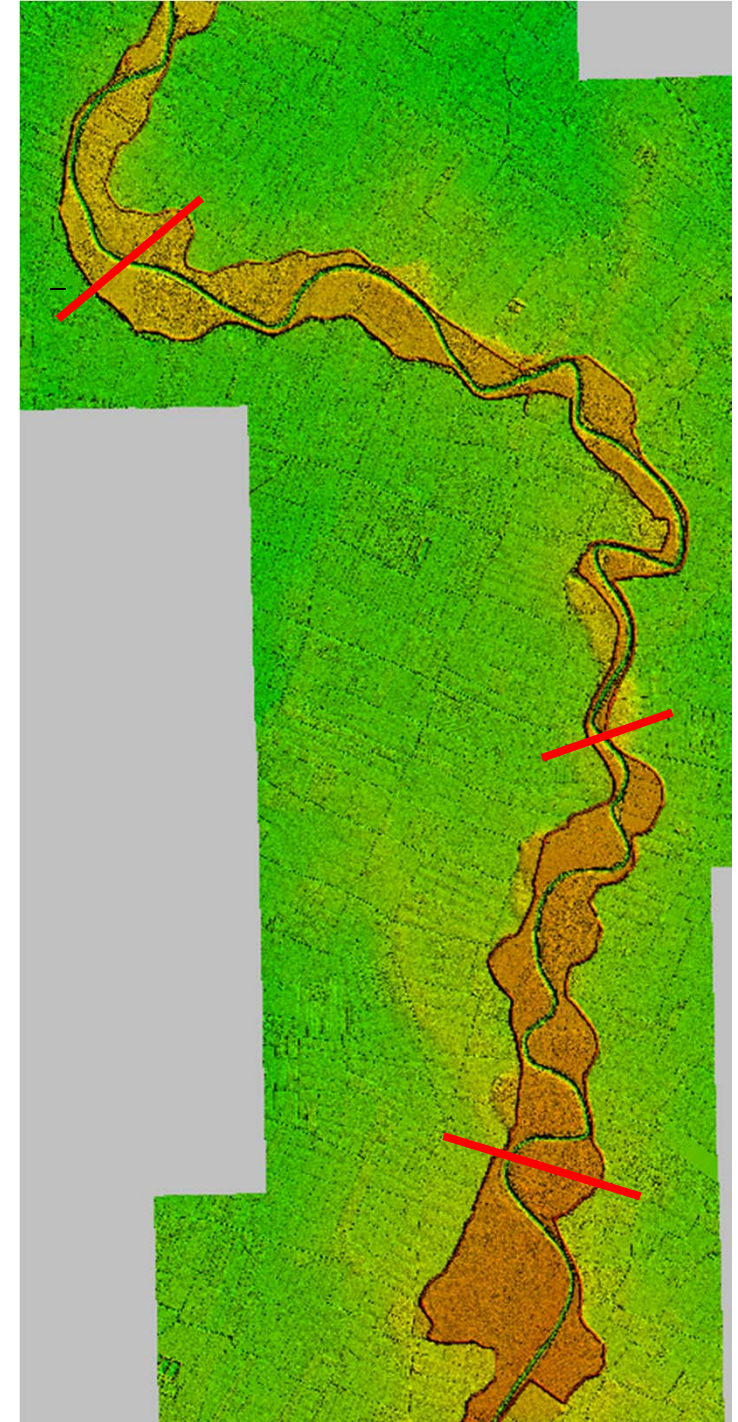
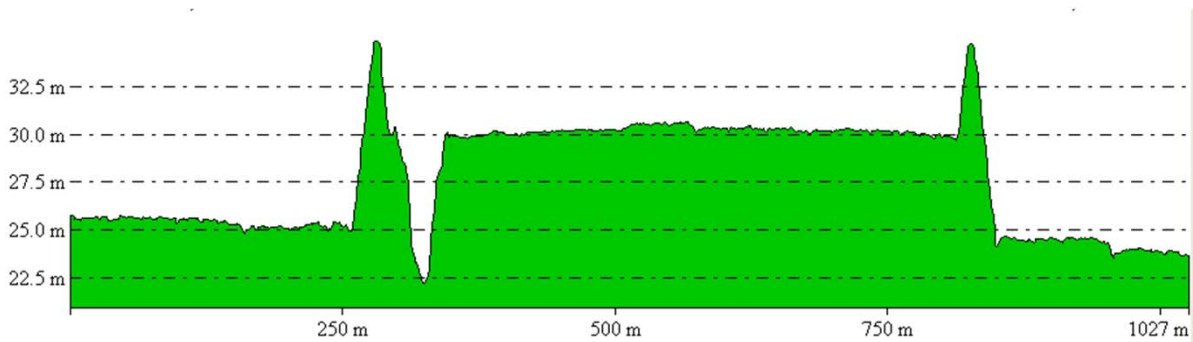
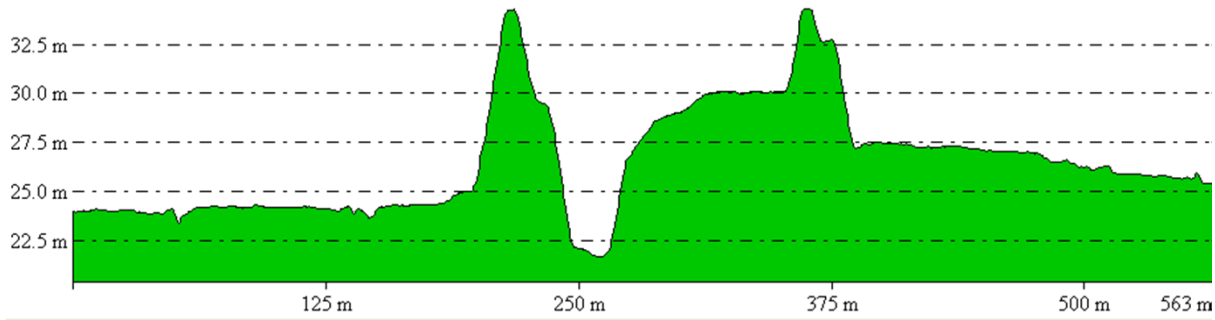
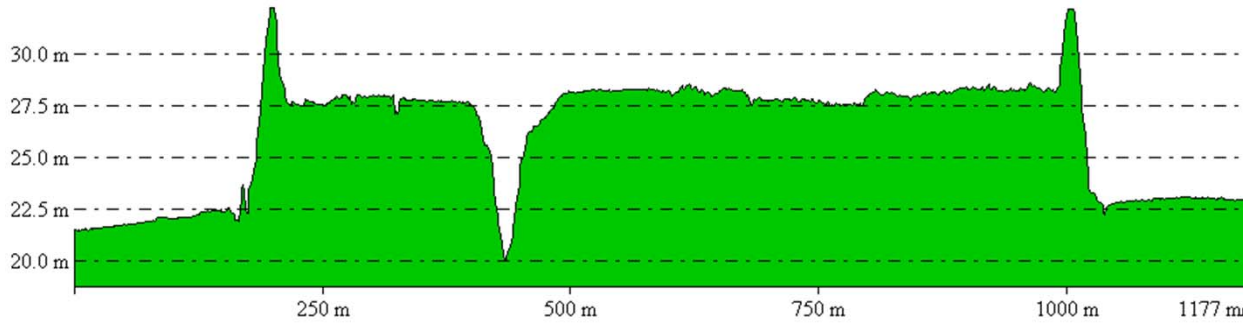


**Flood mitigation reservoir**



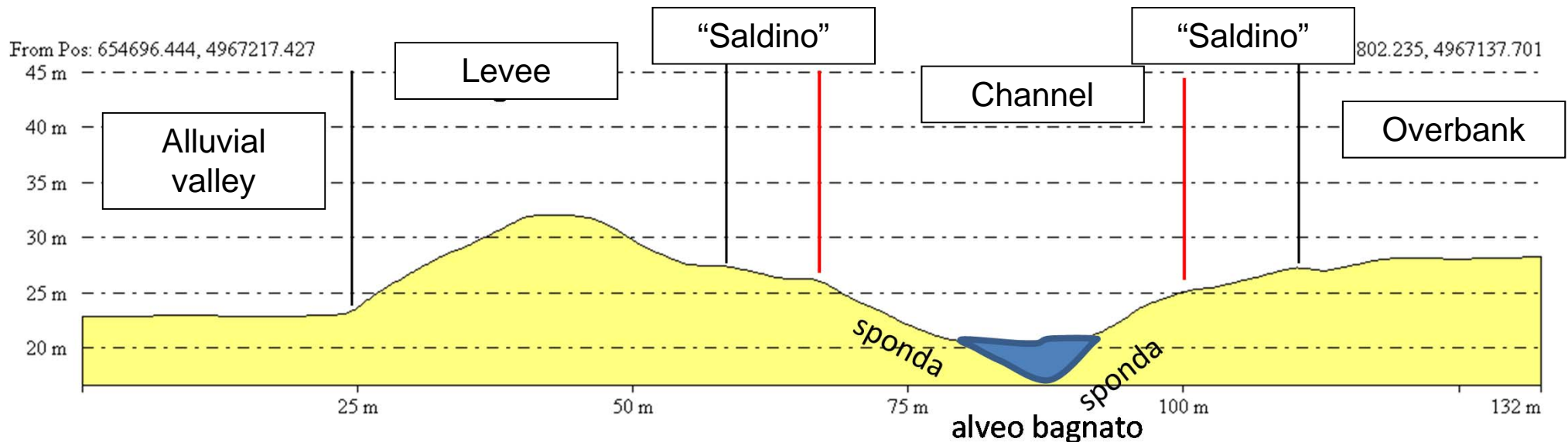
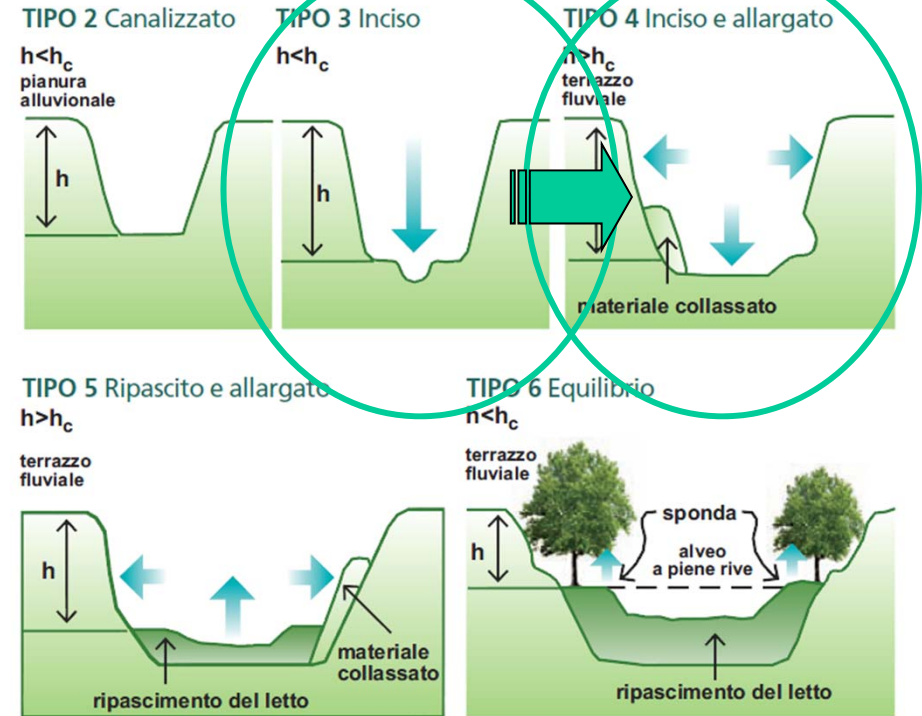


# The overbanks



# The morphology

- The alluvial valley outside of the levees is completely disconnected (only groundwater processes are connected) from the river since 1700-1800, and ground level difference between the valley and the overbanks is constantly increasing
- River channel is narrow and characterized by steep banks, often unstable
- A little step called “saldino” is often noticeable between the levee and the bank or between the overbank and the bank.





# The riparian vegetation





# The riparian vegetation





# The riparian vegetation





# The riparian vegetation





# The riparian vegetation





## The breach

After 3 days of intense precipitation on the Secchia river basin (average 120 mm total), a breach opened in the early morning January 19th , 2014 on the right levee, 5 km upstream the town of Bastiglia. The collapse could have started from wild animals dens

Estimated damages sums up to  
400 M€





# The breach



After the flooding event, the system public administrations involved in the management of the Hydraulic Risk (Emilia-Romagna, Province of Modena, AIPO, municipalities and land reclamation consortia) worked in close cooperation in order to repair instability situations not compatible with the expected safety level, but preserving the environmental value of green resource.

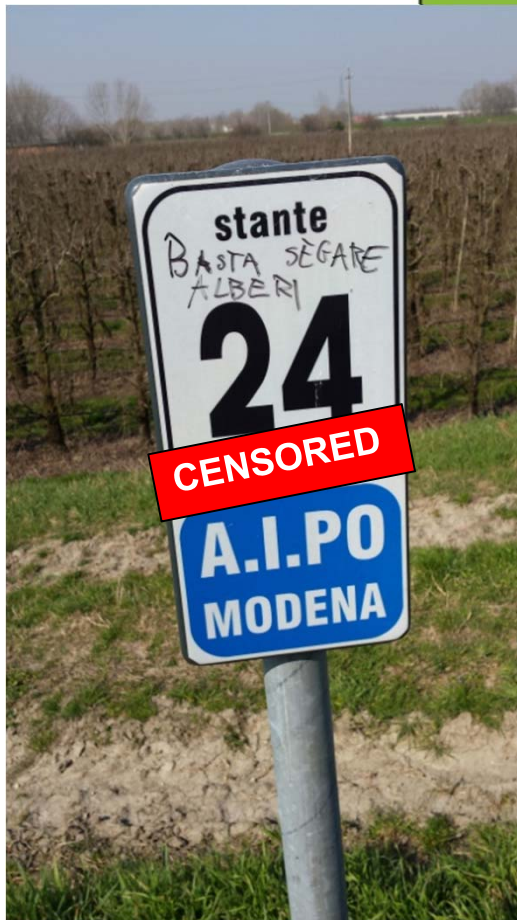
Civil Protection Ordinances issued for this purpose can be downloaded from the web page of the Region Emilia-Romagna: <http://www.regione.emilia-romagna.it/i-provvedimenti-per-alluvione-e-tromba-daria>

Among these, Ordinance n. 3 of 5th June 2014 provides four interventions (two for the river Secchia and two for the Panaro), two of which "at no cost", as the contractors can reuse the material removed

N. Prog.	Operation Code	Province	Municipality	Implementing body	Basin	Action title	Amount
14	10865	Modena	Riverside towns	Interregional Agency for the River Po	River Secchia	Reduction of the presence of shrubs and trees, and removal of deposits in the riverbed, <b>to be implemented through appropriate contracting forms by qualified companies</b>	€ 1.000.000,00
15	10866	Modena	Riverside towns	Po Basin Tributaries Technical Services (Regional Structure)	River Secchia	Reduction of the presence of shrubs and trees, and removal of deposits in the riverbed, <b>to be implemented through appropriate licence contracts</b>	€ 0,00



The press...

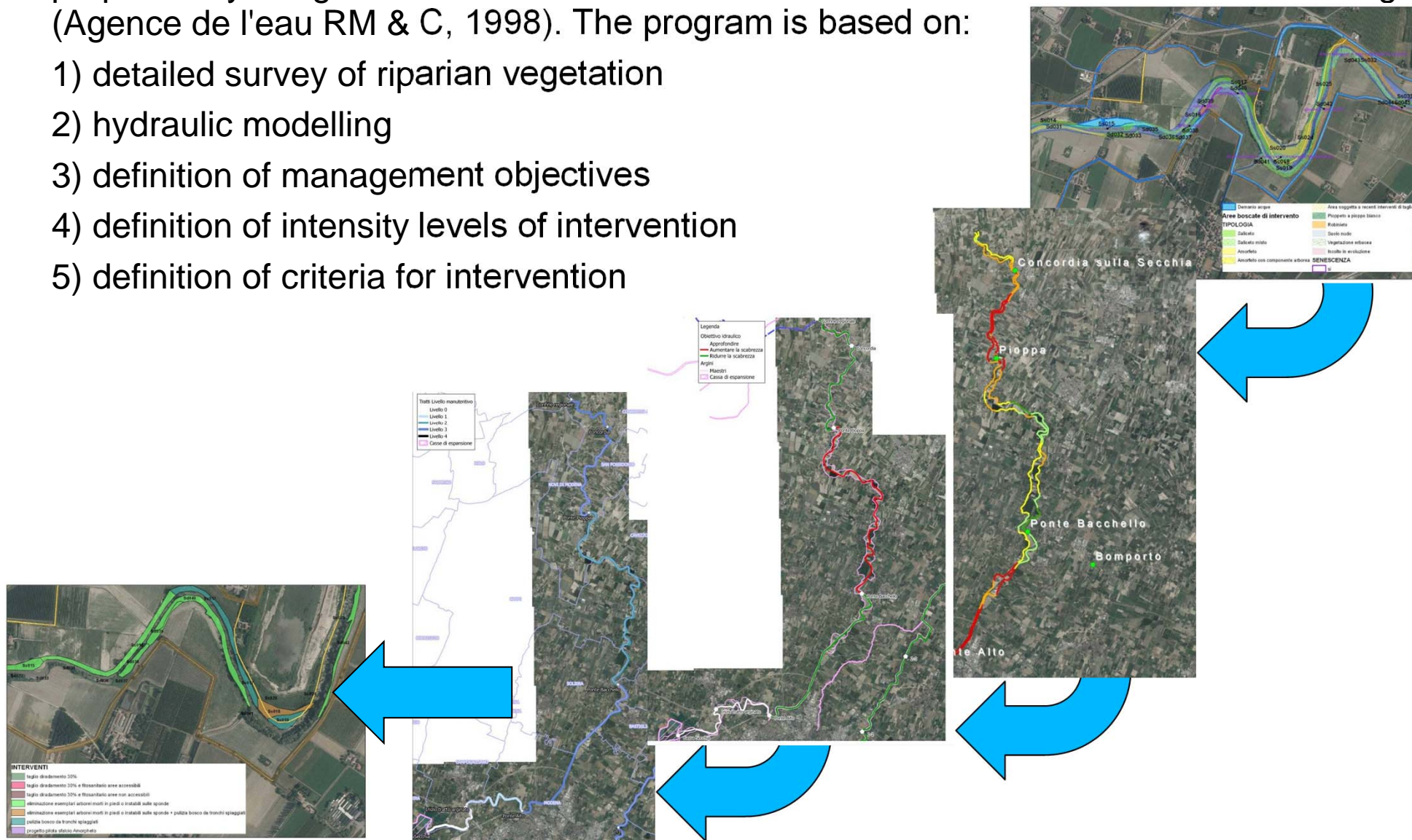


....and the people



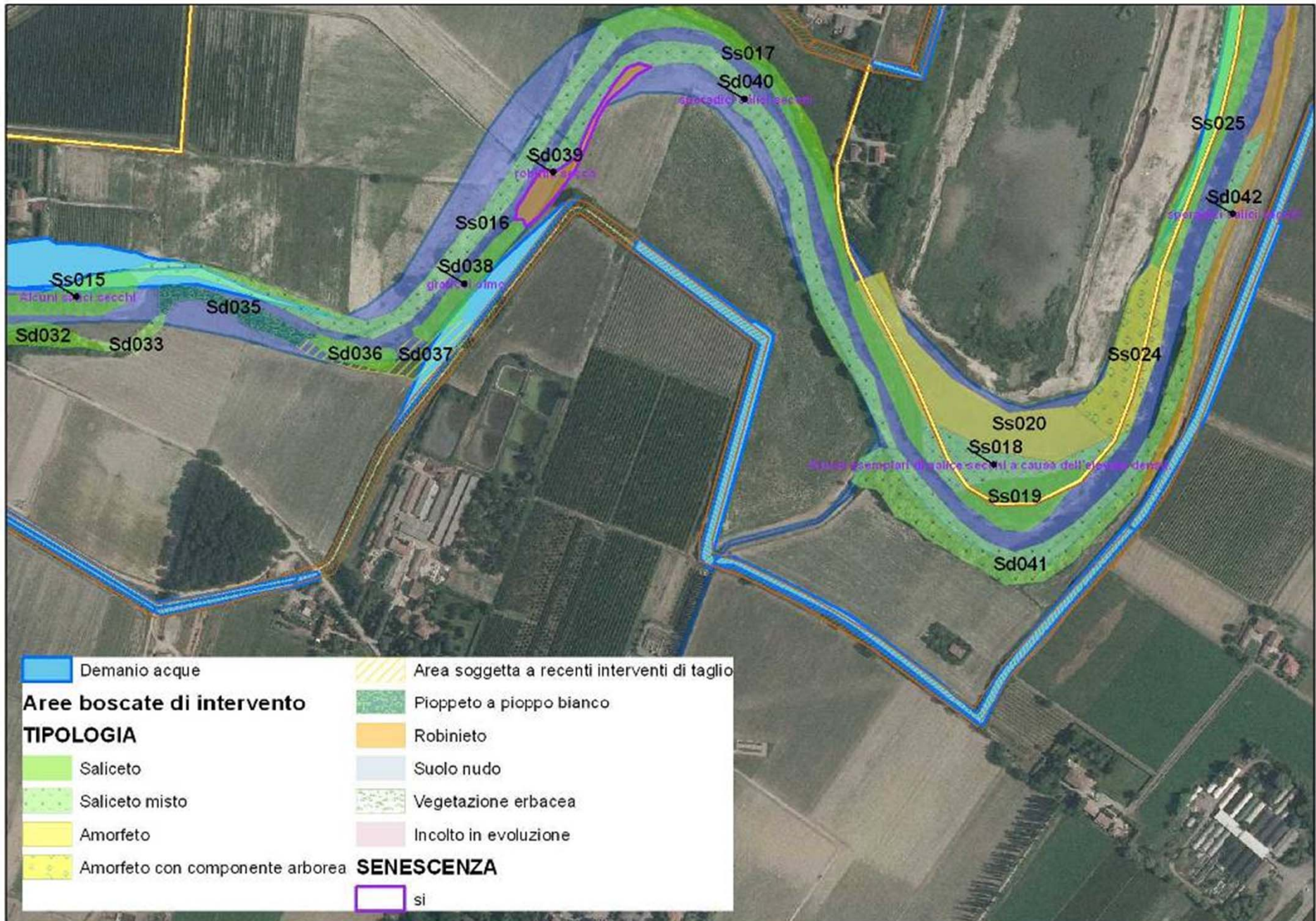
In only three months, AIPO has achieved, and shared with public stakeholders (National Po river Authority, Emilia-Romagna Region, Province of Modena, Municipalities and Park Authority), a "Program for the management of riparian vegetation", using the methodology proposed by the guidelines of the SDAGE Rhone-Mediterranean and Corsica Water Agency (Agence de l'eau RM & C, 1998). The program is based on:

- 1) detailed survey of riparian vegetation
- 2) hydraulic modelling
- 3) definition of management objectives
- 4) definition of intensity levels of intervention
- 5) definition of criteria for intervention



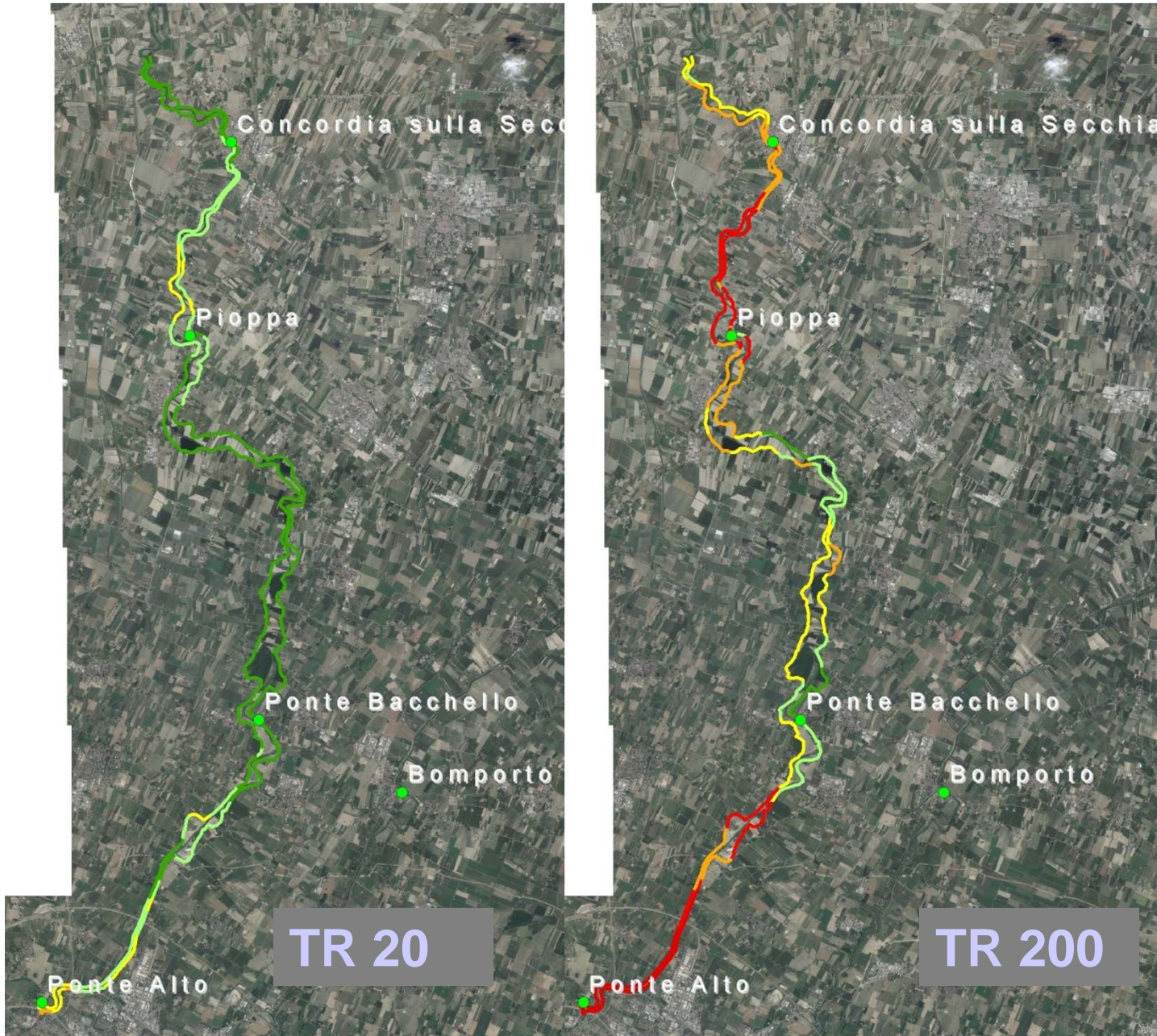


# 1) Detailed survey of riparian vegetation

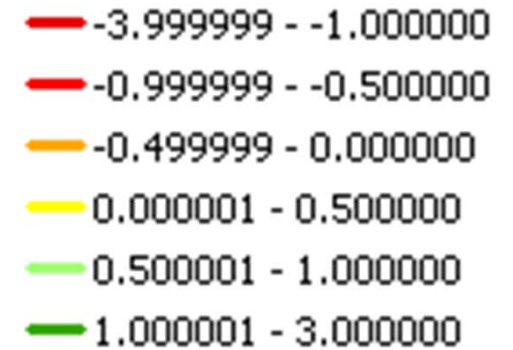




## 2) Hydraulic modelling



River reaches with narrower levees are also the most vulnerable with respect to severe flood events



Difference between maximum expected water level and levees height for floods with return period of 20 and 200 years



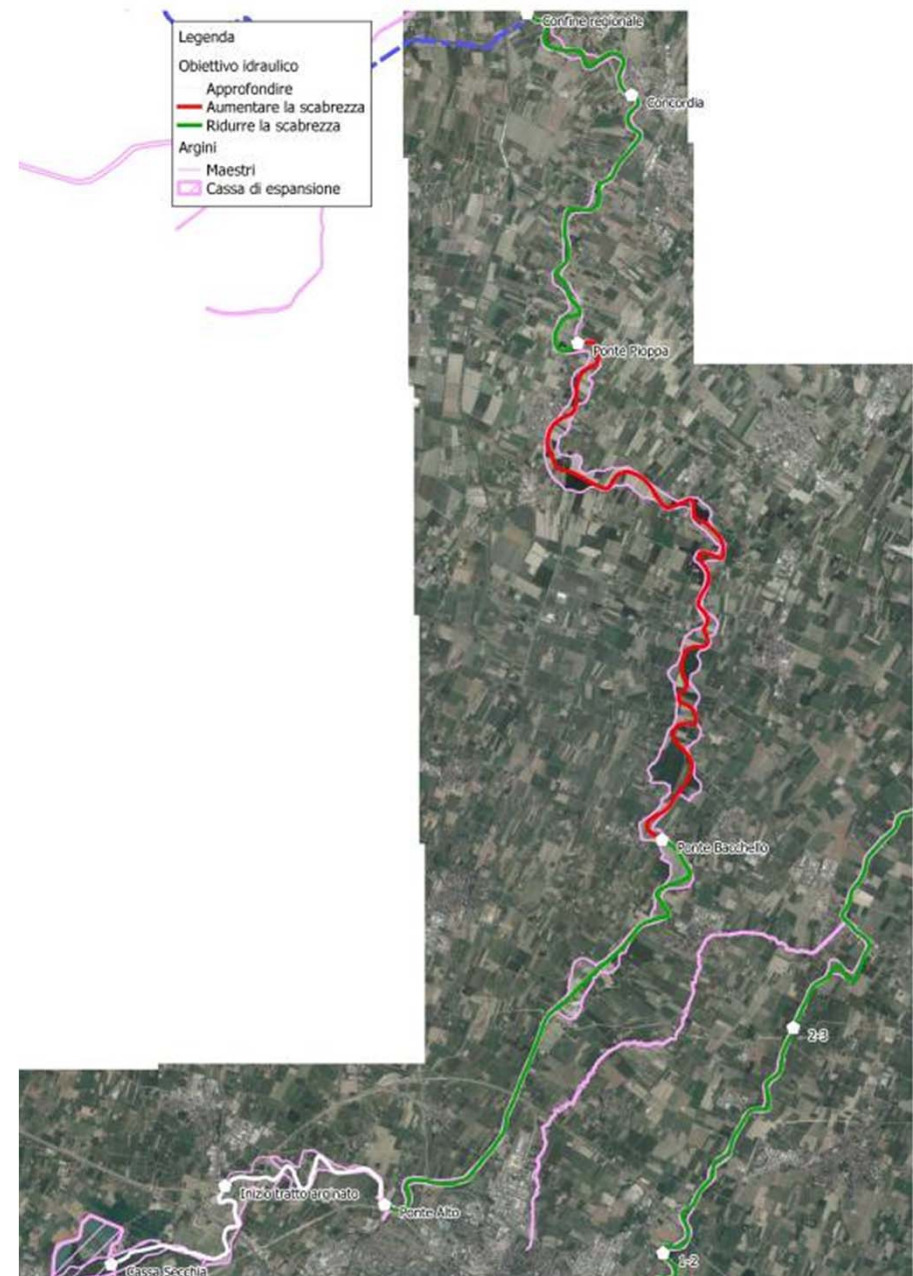
## 3) Definition of management objectives

A. Strictly hydraulic, as the presence of vegetation influences the wave propagation speed, locally affecting water levels and propagation time. In the specific case, this determines also the duration of the contact between levees and water and the filtration mechanisms.

B. operation in surveillance activities and routine maintenance of the levees and works connected, because the presence of dense and impenetrable vegetation inhibits the supervision of banks and overbanks to check the dens of animals or landslides

C. stability of banks and levees, because depending on the tree species and on their degree of senescence, riparian vegetation can act improving or maintaining the consolidation of banks or otherwise induce run-off, collapse or landslide (in the case of single mature trees in bad condition).

D. managing and maintaining a design vegetation structure, consistent with the hydraulic objectives, with organizational resources available, and economically sustainable.





### 3) Definition of management objectives







**AIPO**  
Agenzia Interregionale per il fiume Po

## 3) Definition of management objectives



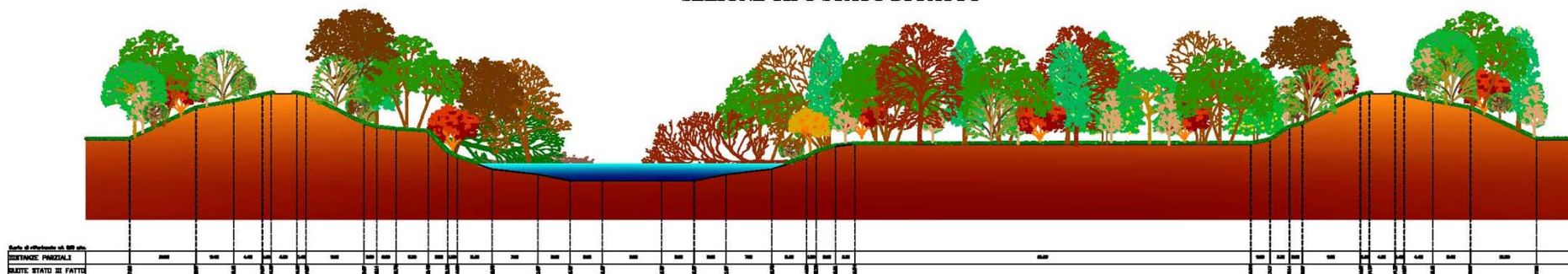






## FIUME SECCHIA - SEZIONE TIPO

SEZIONE TIPO STATO DI FATTO



Corpo arginale - zona libera da alberature di ogni tipo, compresi 4 m. a lato fiume e a lato campagna, a partire dal ciglio della scarpata

Sponda d'alveo:  
 1) Diradamento selvicolturale intenso (asportazione fino al 70% massa presente), piantumazione astoni di salice arbustivo

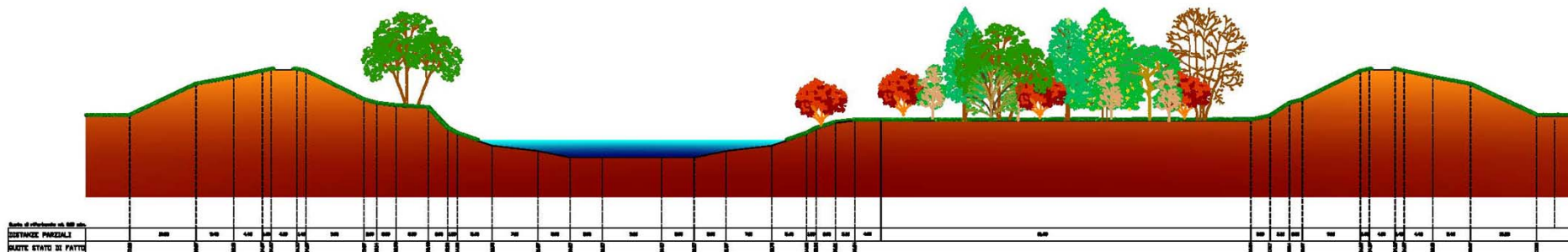
Alveo attivo del fiume  
 taglio raso e eliminazione piante morte o pericolanti

Sponda d'alveo:  
 2) Diradamento selvicolturale leggero (asportazione 30% massa presente) da liberare da alberature secche, rovesciate e piante con diam. >25 cm

Area golenale  
 1) oggi: piccole manutenzione per evitare alberature trasportate, da liberare da alberature secche, rovesciate  
 2) con concessione

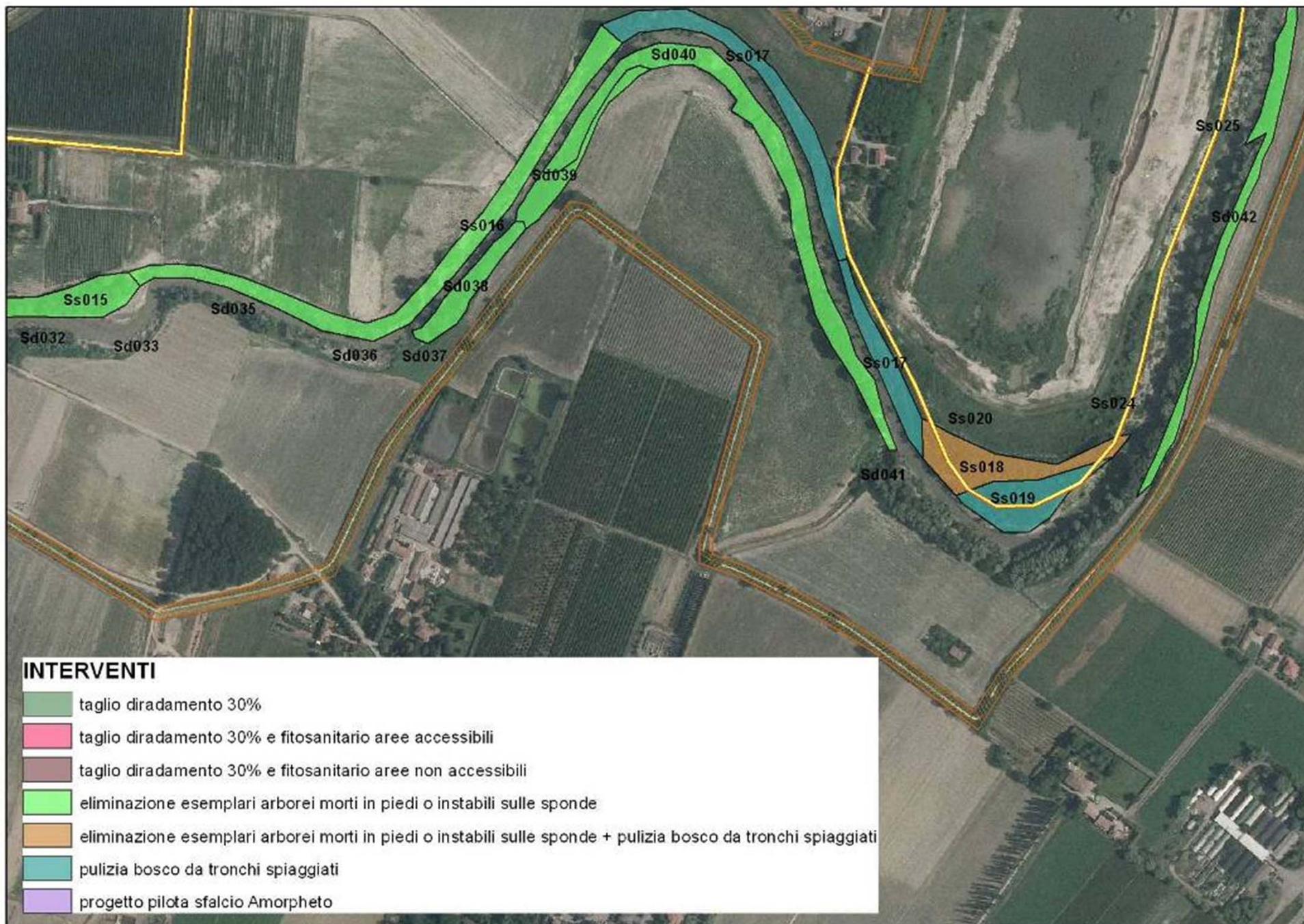
Corpo arginale - zona libera da alberature di ogni tipo, compresi 4 m. a lato fiume e a lato campagna, a partire dal ciglio della scarpata

SEZIONE TIPO DOPO L'INTERVENTO





## 5) Definition of criteria for intervention







**before, spring time**

**during the works, now**









**before, spring time**



**before, winter time**



**during the works, now**





Operating machine drowned into the mud...



Steep banks almost  
always submerged



The “toolbox” for the riparian vegetation integrated management planning seems to be full of knowledge and managing elements...



...but what we need is the sharing of the practical methods for the plans implementation....  
and monitoring, monitoring, monitoring





# Riparian vegetation management along the Secchia river (northern Italy)

Experimenting sustainable management practices

F. Filippi, PG. Bensi, S. Pavan, F. Pellegrini and L. Petrella

THIRD INTERNATIONAL CONFERENCE ON  
WOOD IN WORLD RIVERS 2015

University of Padova  
ITALY July 6-10, 2015