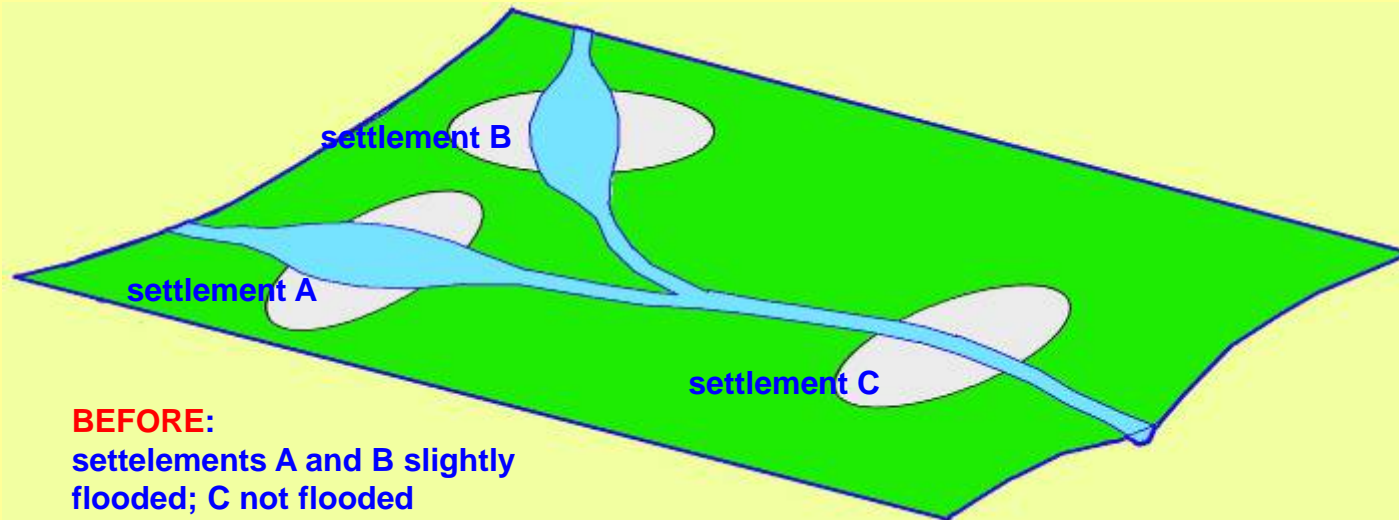
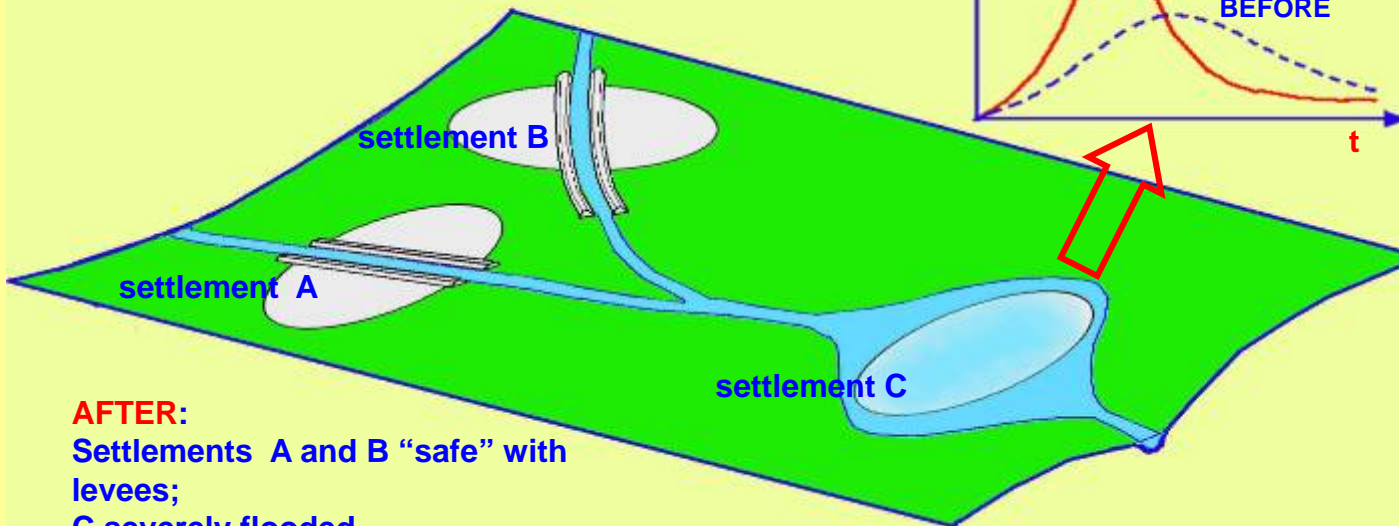


...export damages

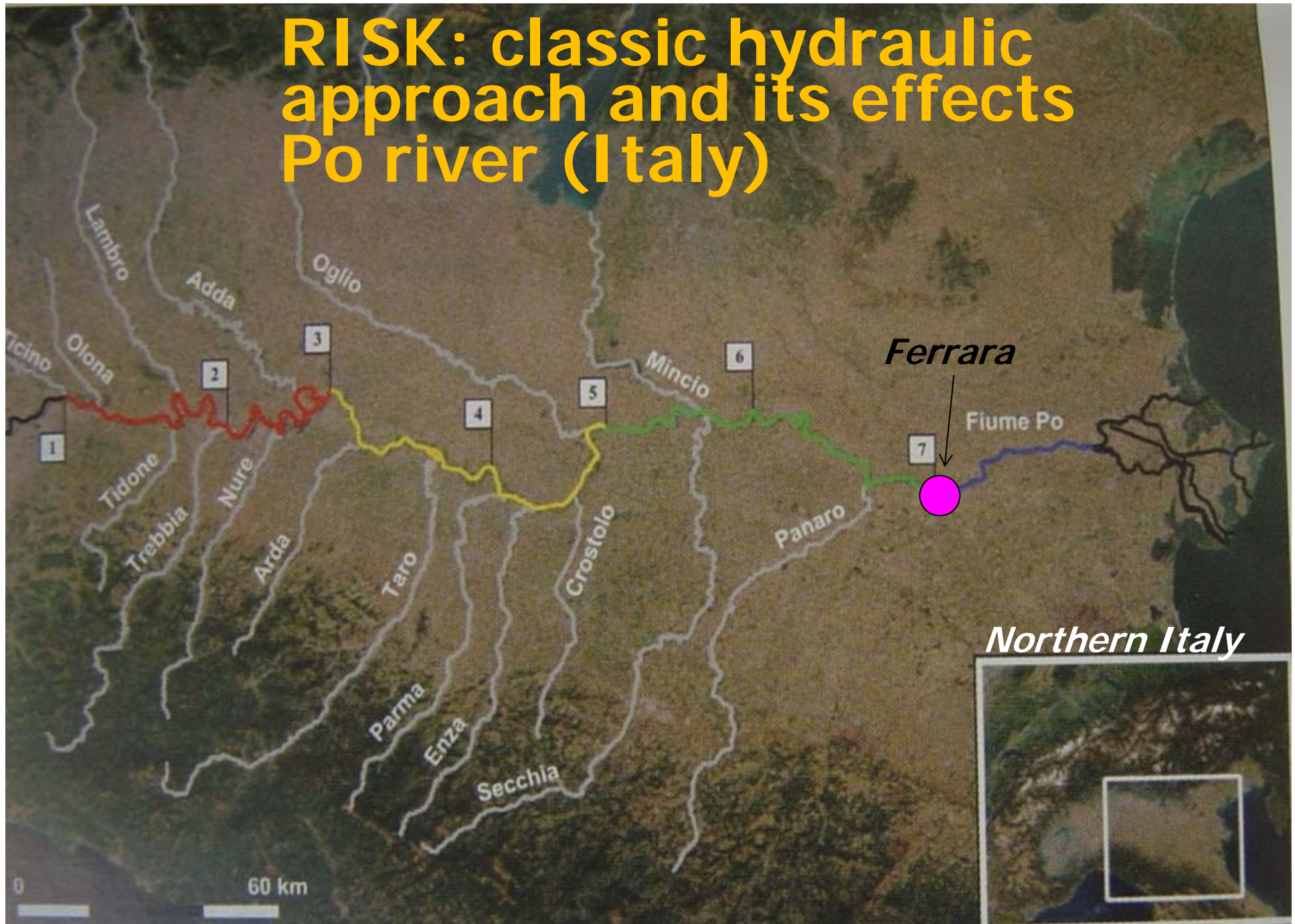


BEFORE:
settlements A and B slightly
flooded; C not flooded



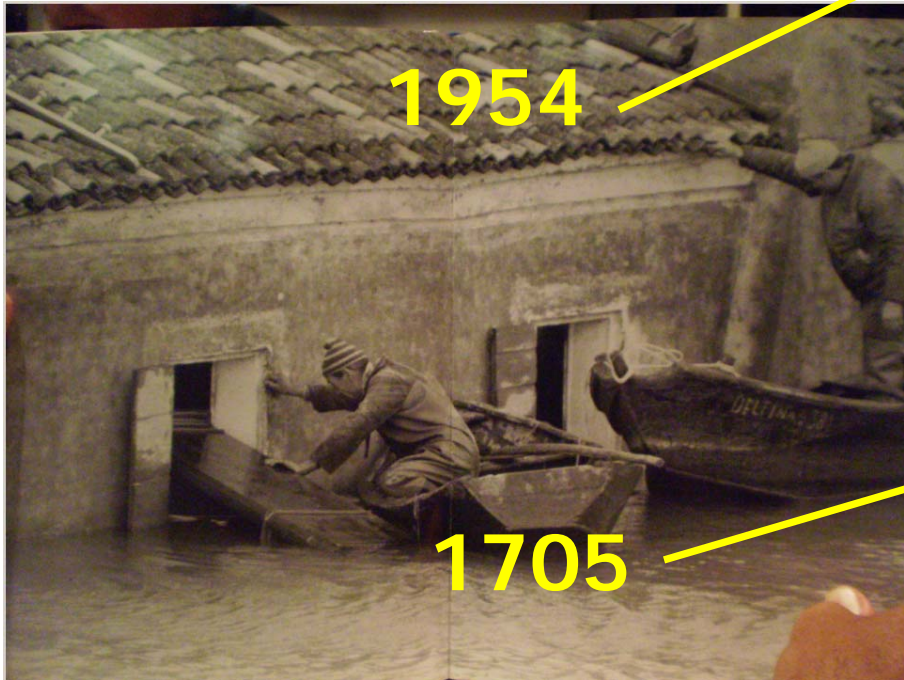
AFTER:
Settlements A and B "safe" with
levees;
C severely flooded

RISK: classic hydraulic approach and its effects Po river (Italy)

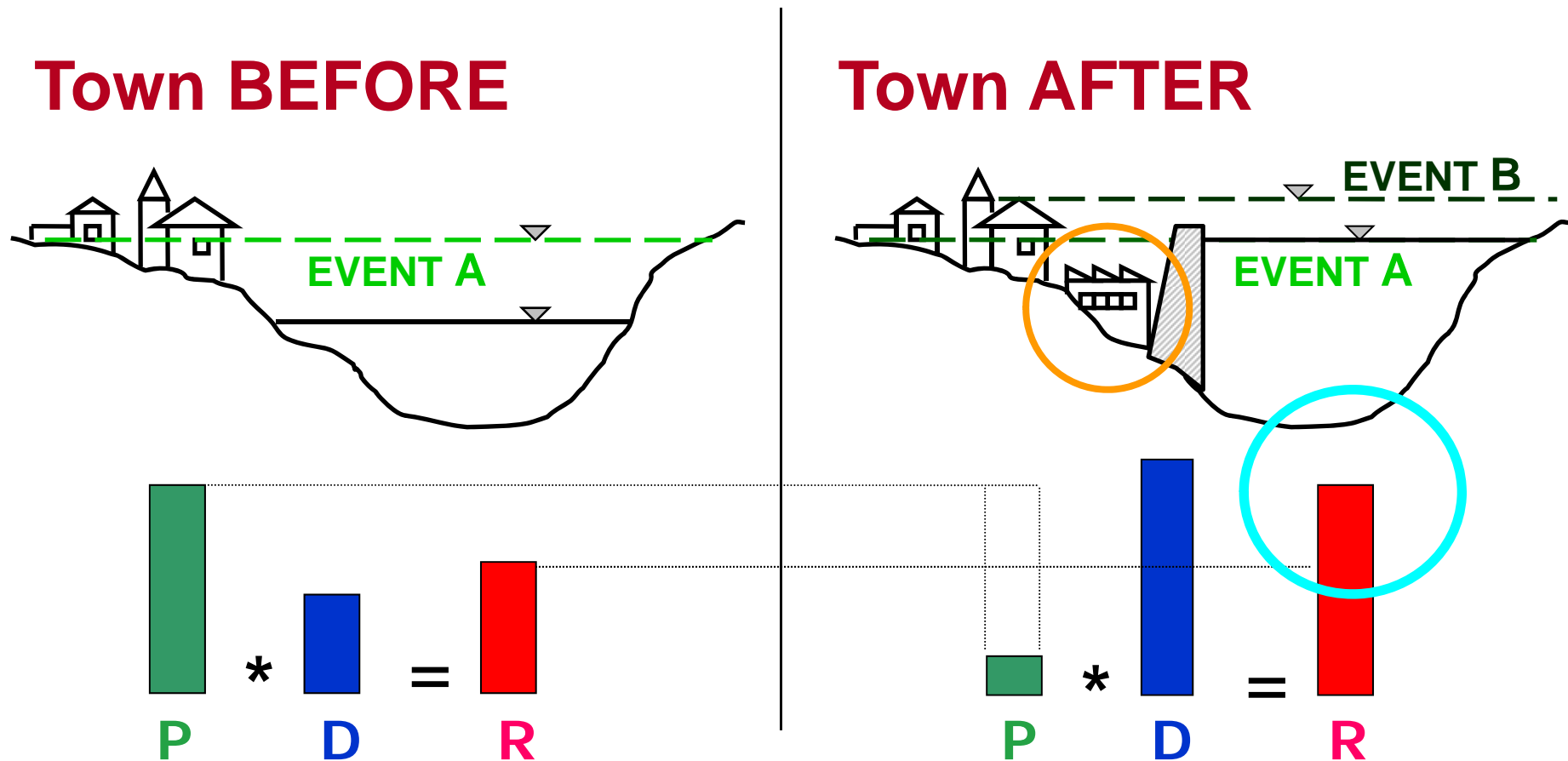


Rio Po (Italy): result

today...



The "safe conditions" paradox



⇒ the risk increased !!

In addition, climate change ...

Urban planning?



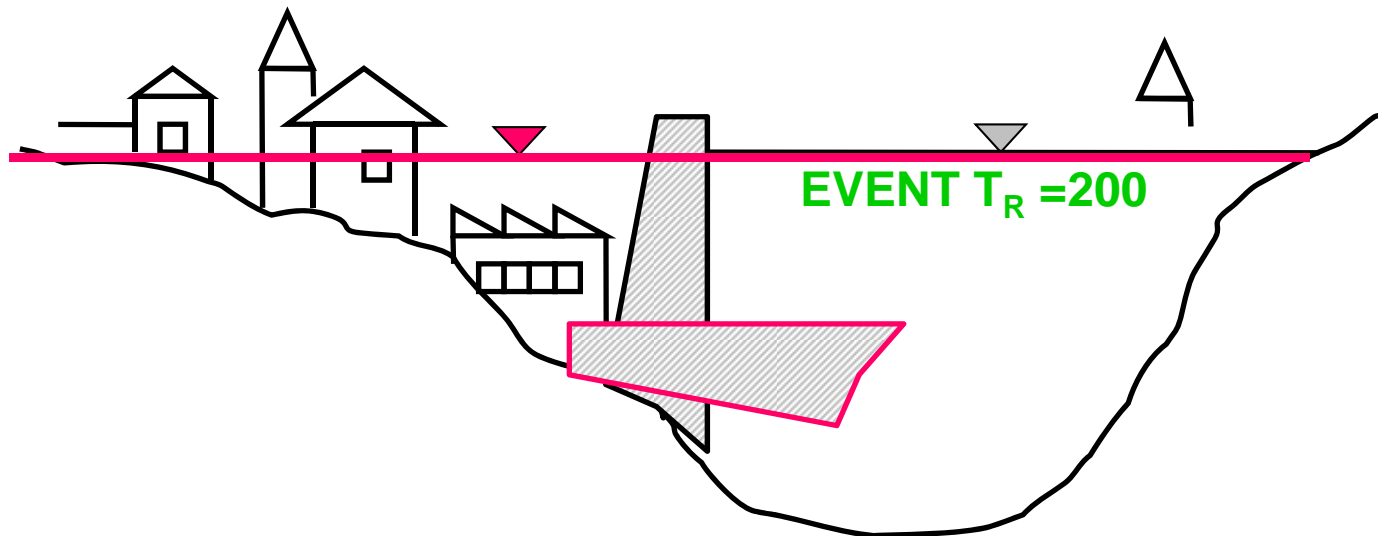
Levees for or against safety??

... *FRAGILITY!*

RISK: $R_{200} = 0$?

RISK: $R_T > 0!$

$R_T(\infty) \gg 0!!$



⇒ *FRAGILITY HIGH....!!!*

An approach
really
“CLASSIC” !

A touch of history

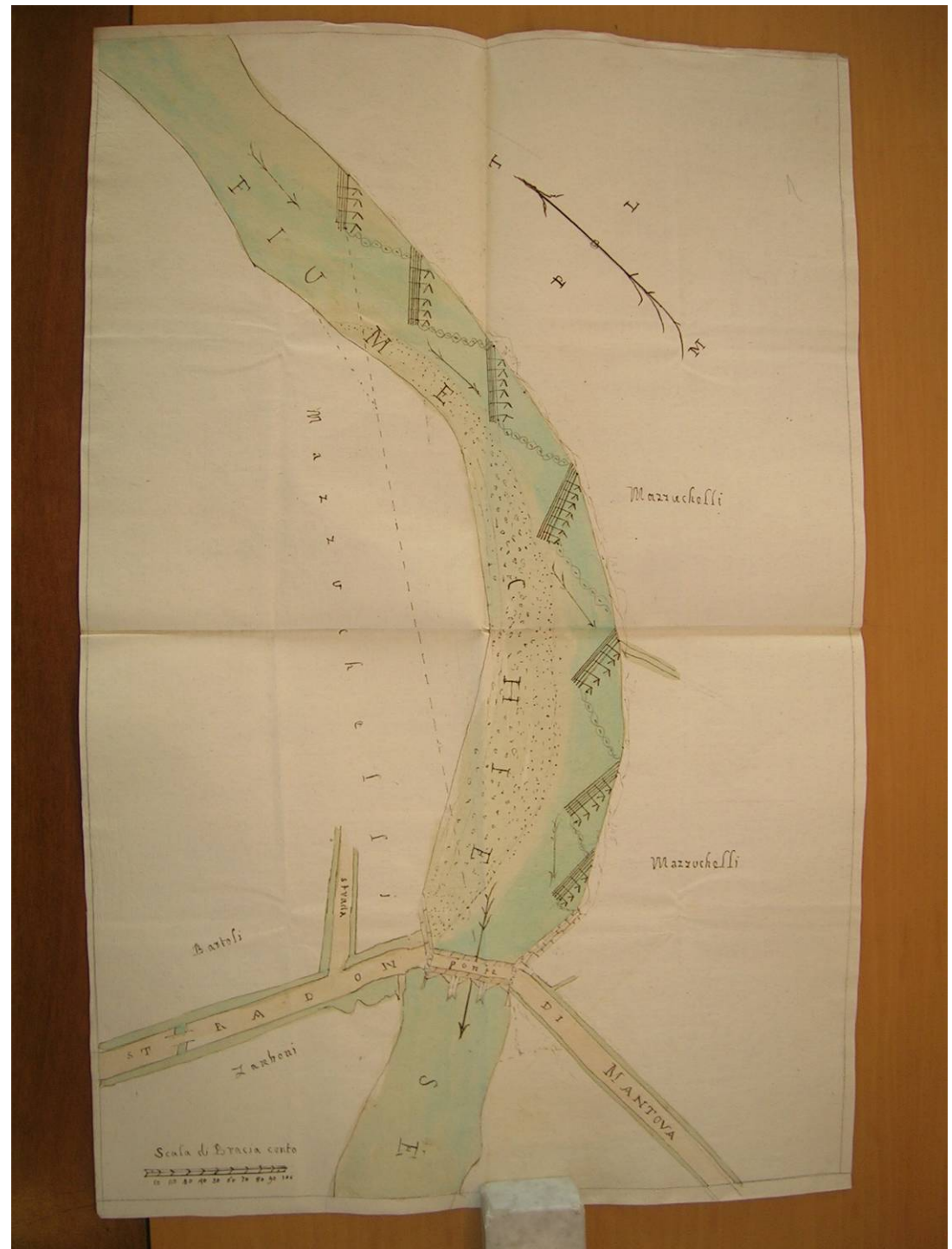
Montichiari

1805

(Archivio
Stato MI)

← 1500

← 1300



Hydraulic approach: who pays!?

infrastructuring =
Taxes in biberon!



Ministero delle Finanze

Carissimo neonato,

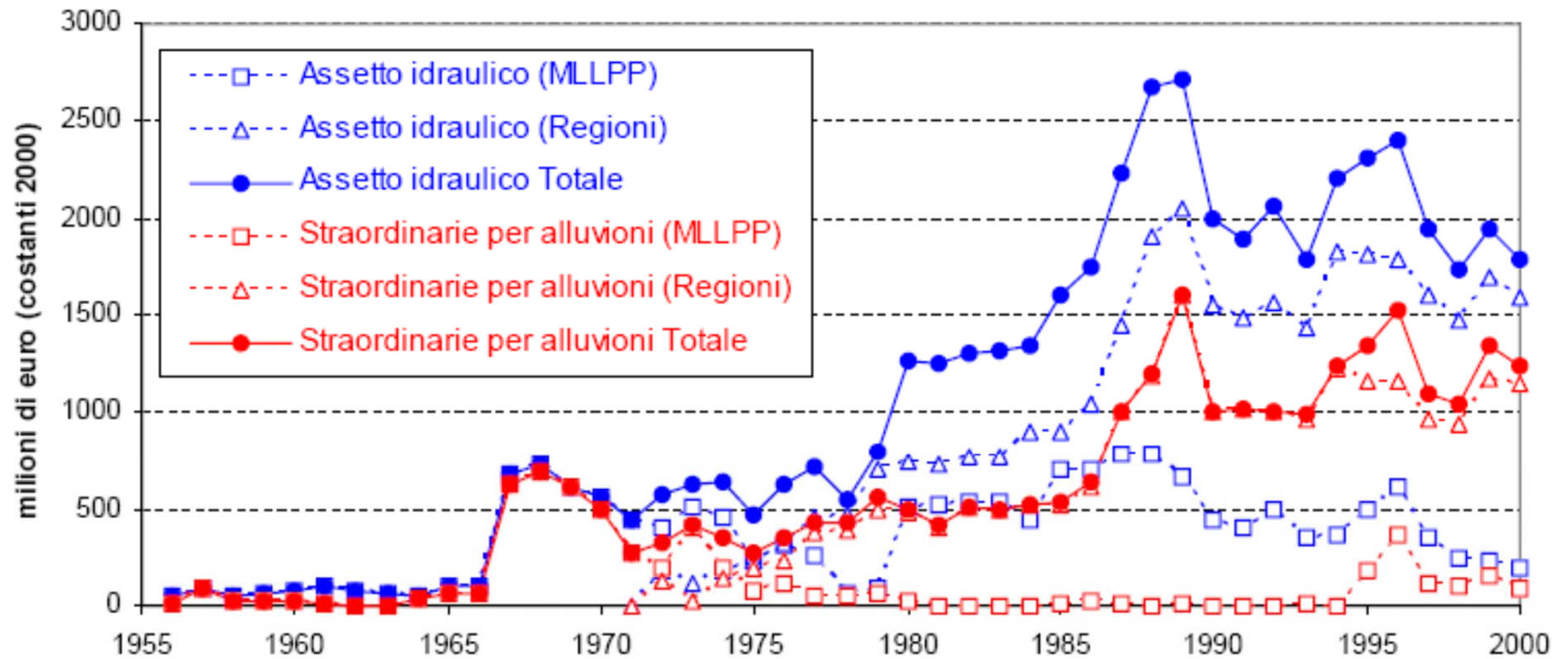
benvenuto in questo mondo! Ecco la tua prima cartella delle tasse sui fiumi

argini	€	25,00
difese spondali	€	17,00
briglie	€	9,80
dighe	€	7,50
taglio vegetazione	€	4,30
rimozione sedimenti	€	4,30
pulizia tombamenti	€	2,50
derivazioni	€	3,80
canalizzazioni	€	13,00
bonifiche	€	15,50
fognature	€	9,00
acquedotto	€	9,00
depurazione	€	5,60
pennelli e scogliere	€	
13,80		
ripascimenti	€	
12,00		
ponti	€	6,50
stabilizzazione frane	€	18,00
danni alluvionali	€	15,70
Protezione civile	€	9,75

ecc.. ecc.

Rio Po: results

Spese Min. LL.PP. e Regioni, per assetto idraulico e per alluvioni



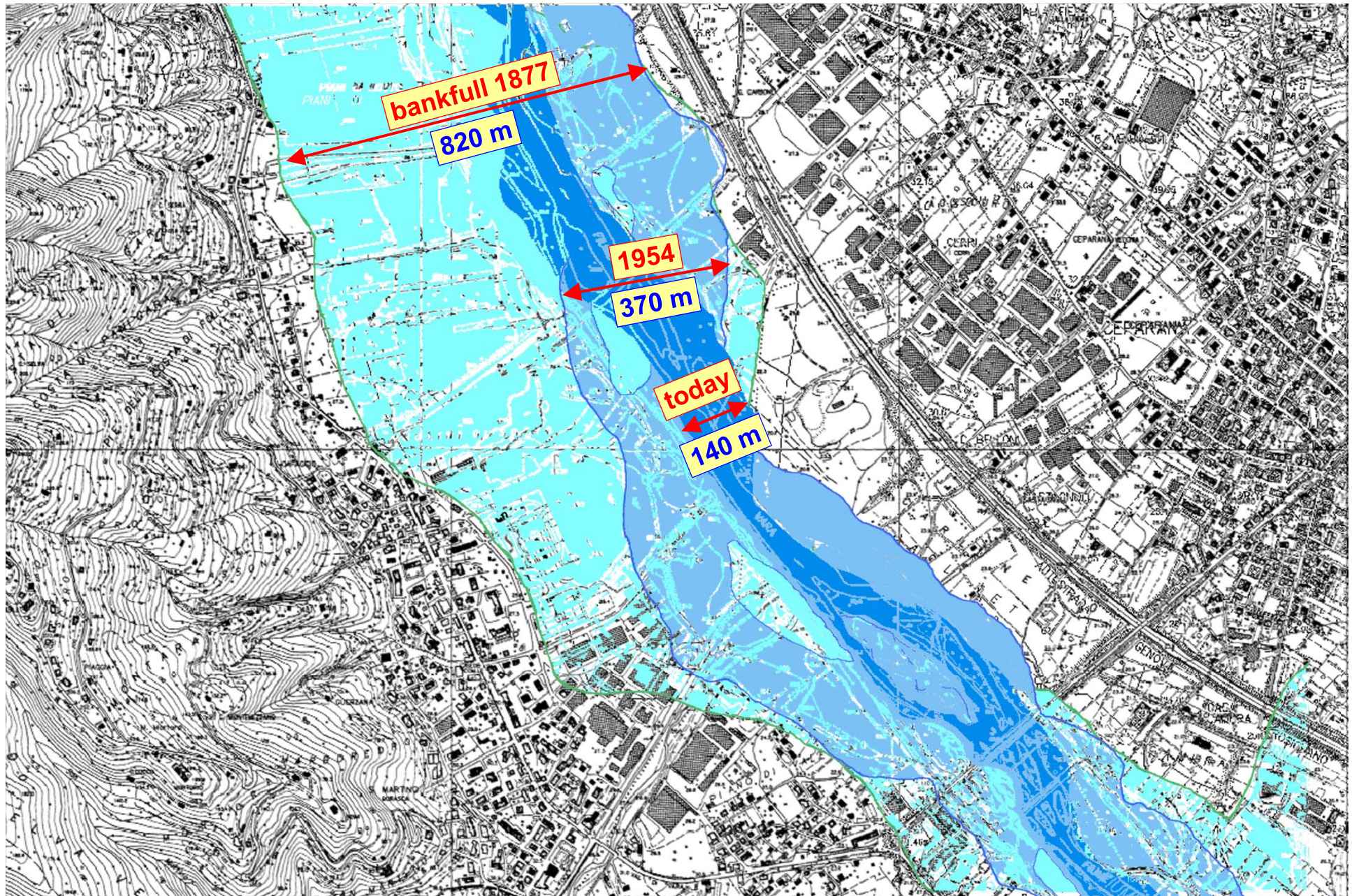
Hydraulic approach: summary

PUT in SAFE conditions
paradoxically increases risk

- Exports hazard elsewhere
- Industrial safety → increase potential damage
- Increases system FRAGILITY

NOT SOLVED !!!

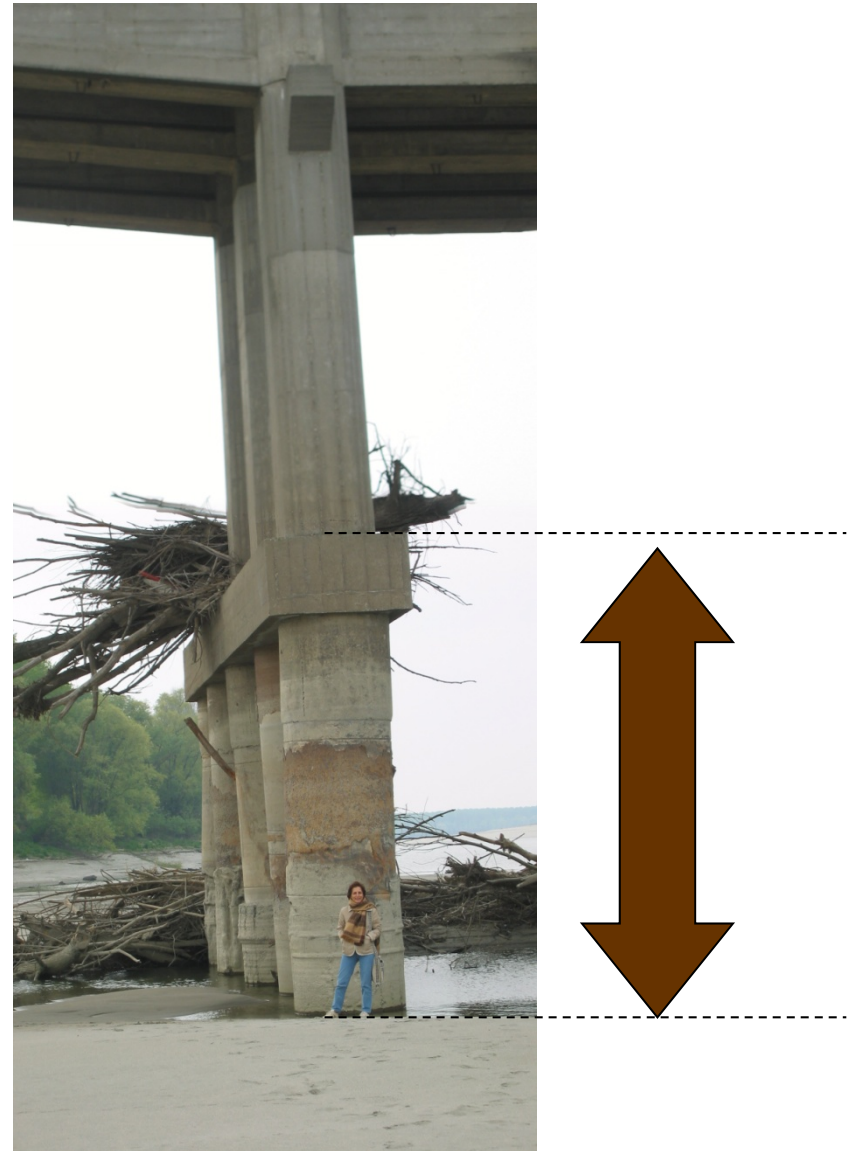
....River incises and narrows



→ bridges break down



Loss of geomorpho equilibrium

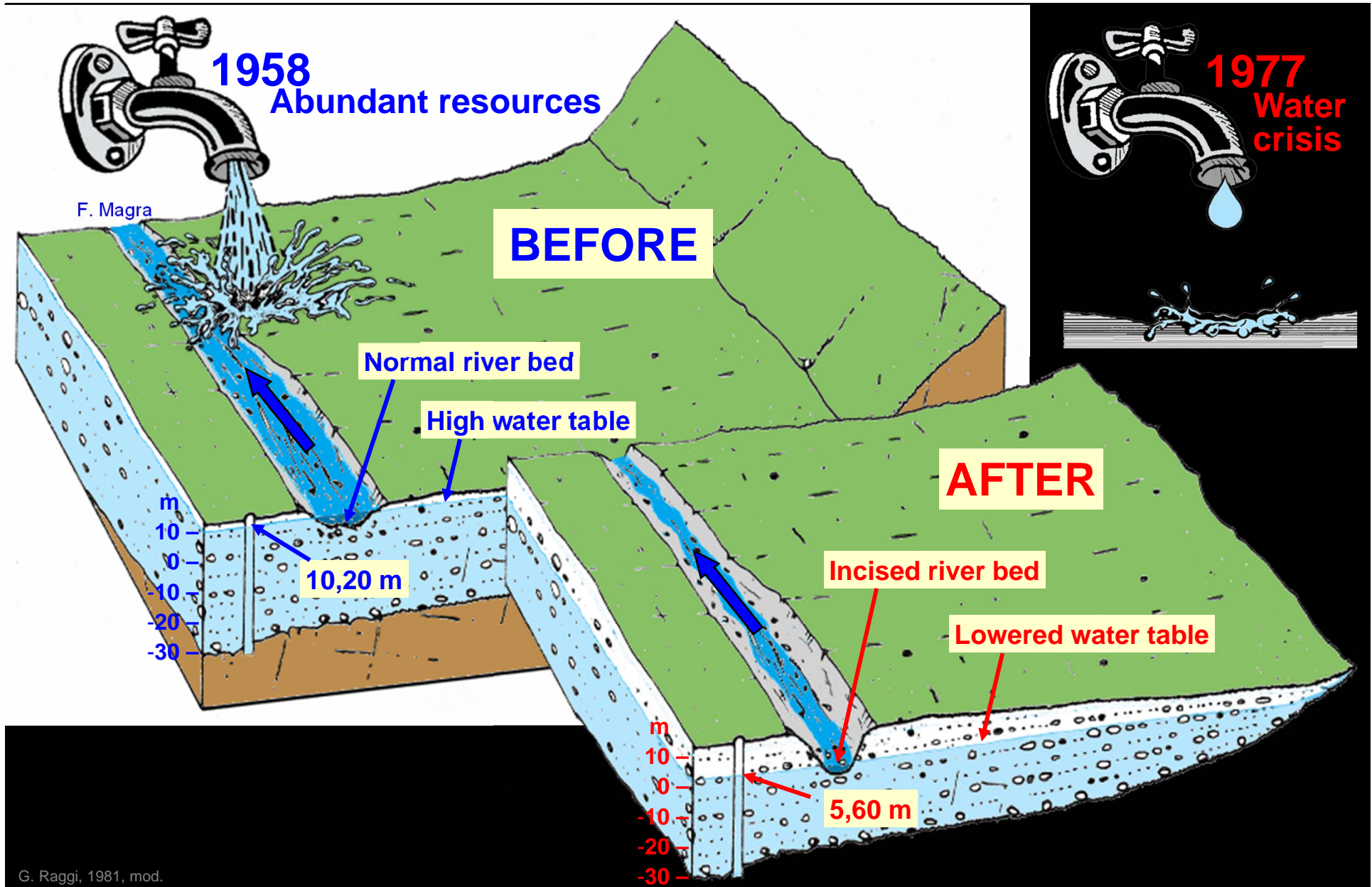


...reduction of solid flow → coastal erosion

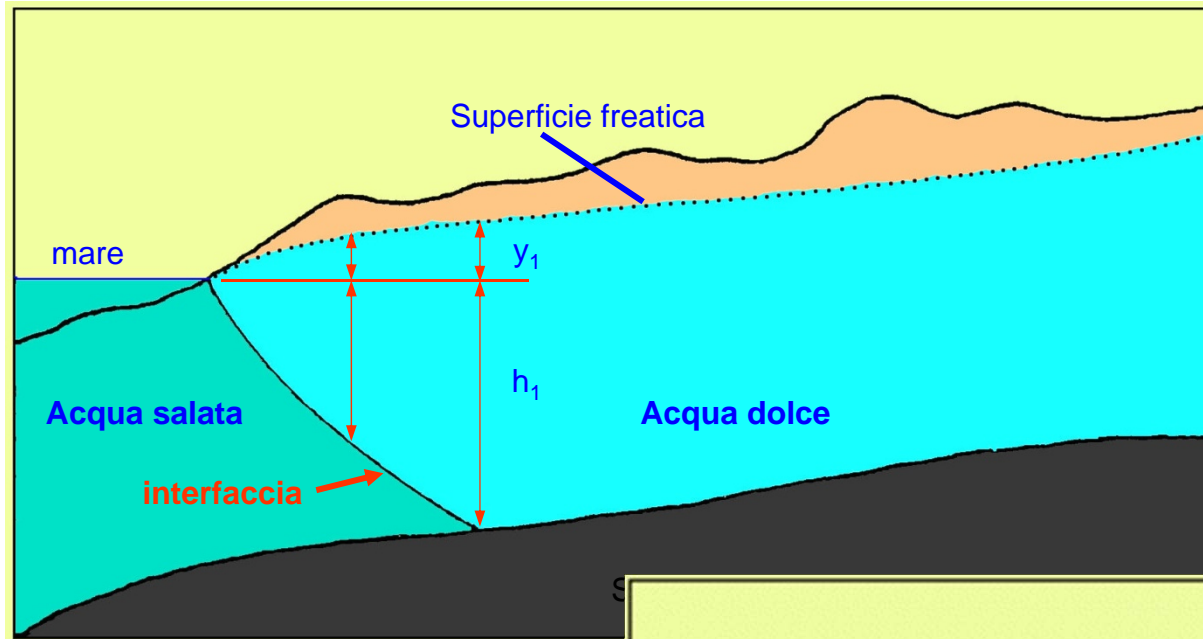


benefits: private
costs: public

incision of river bed → drying-up aquifer



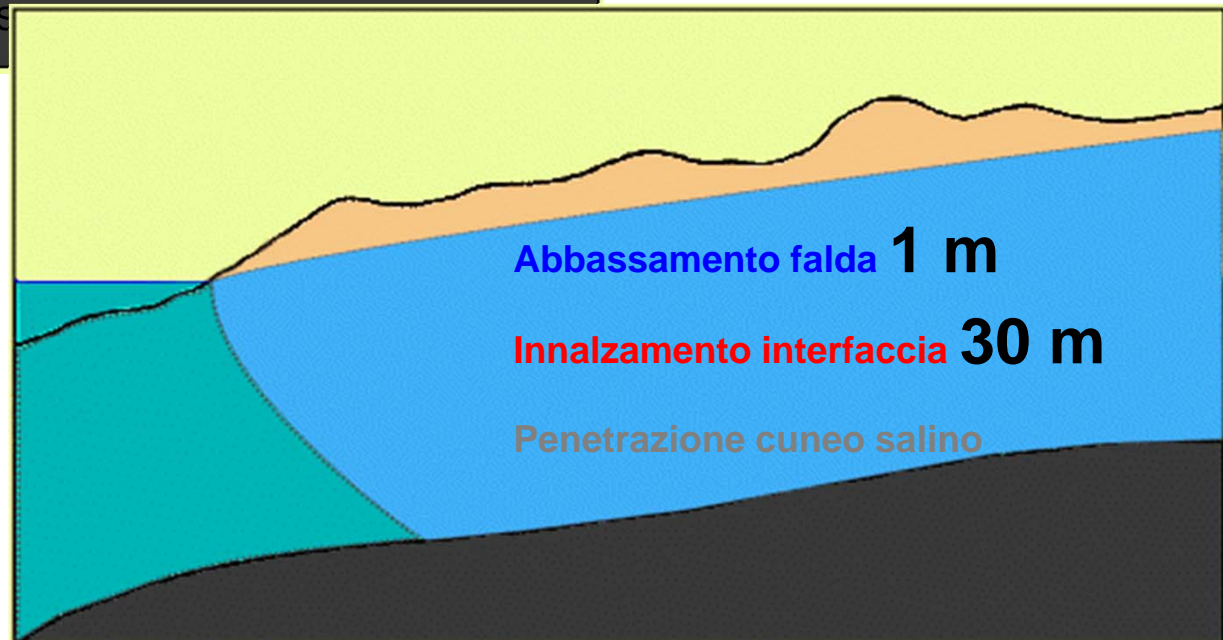
incision → salin intrusion



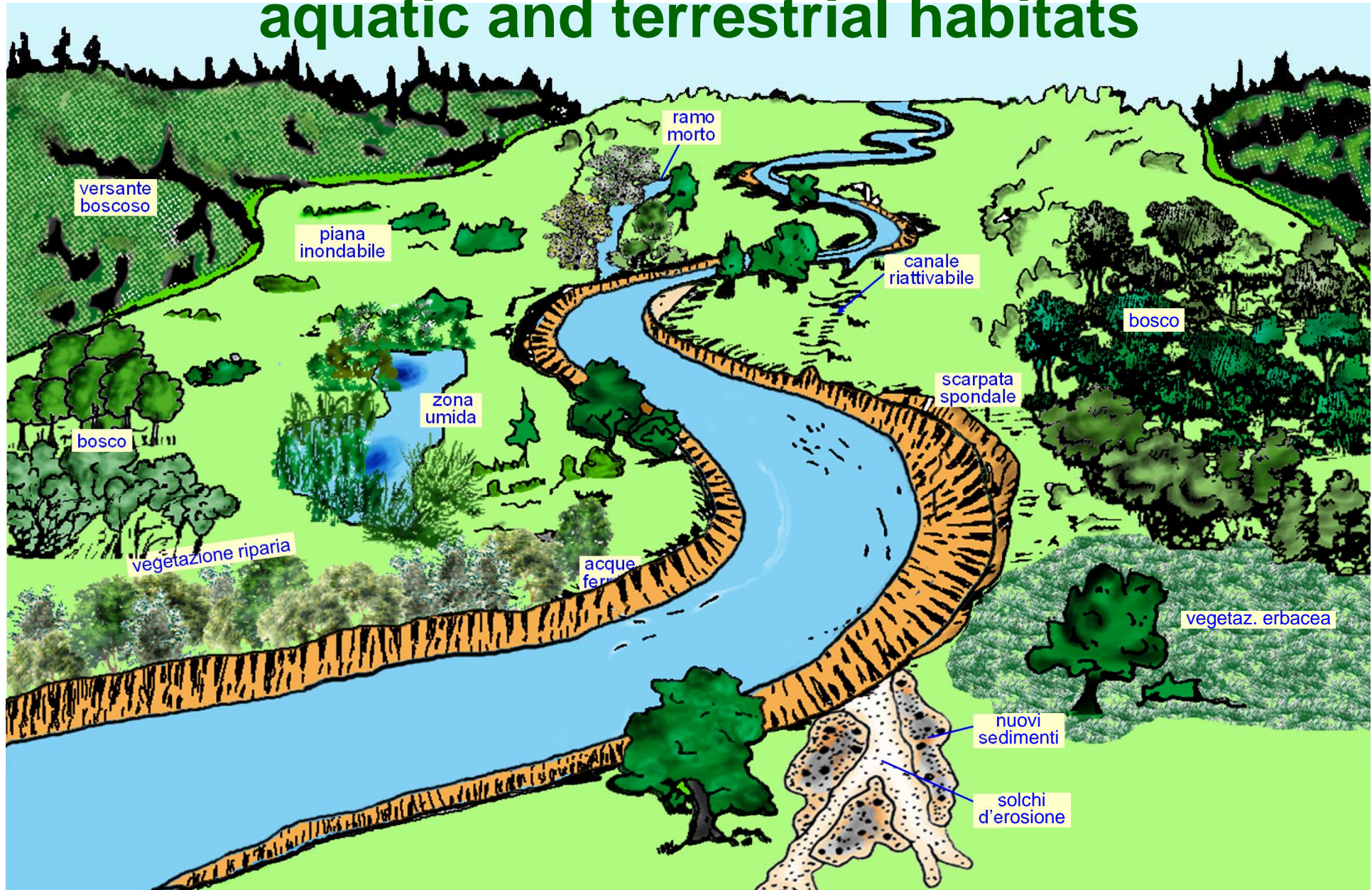
$$h = \frac{y}{d_s - d_d}$$

$$d_s = 1,035$$

$$d_d = 1,001$$



...canalization effectón → loss of aquatic and terrestrial habitats



Hydraulic analysis summary

PUT in

NOT SOLVED !!!

+ ENVIRONMENTAL IMPACTS

- Increase in ...
- Increase in ...
- Increase in ...

FRAGILITY

River Restoration for SAFETY

hence:

- which approach?
- which solutions?

River Restoration for SAFETY and more European Union DIRECTIVES:

- Flood Directive (FD; 2007/60)
- Water Framework Directive (WFD;
2000/60)
- Waste Water treatment Dir.
 - Nitrates Dir.
 - Groundwater Dir.