Brague river

DEMO Partners: irstea · Université Nice Sophia Antipolis – IMREDD · CCR

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STAKEHOLDER ENGAGEMENT

Stakeholders group	N° engaged
Public	~12
Private	~5
Insurance	12
Locals (farmers, residents)	~10

1. Individual interviews → 5 long ones to get risk perception and 10+ small ones during data gathering
2. A stakeholder workshop → discussions on risk management, perception of NBS vs. grey solutions with 20 local participants
3. Focus groups on economy and biodiversity → discuss on local challenges, select relevant criteria and tailor the related indicators

Main issue: Political sensitivity of the flood management topic. Since the 2015's disaster (4 deads, 50 M€ of damages, etc.), the trauma is still strong and the management of flood risk a "hot" topic → Huge efforts to prepare any communication or workshop

Co-Benefits Desk review:

- Ecological status of the Brague catchment
- NBS measures (NWRM list)
- Co-impacts of NBS measures using ecosystem services and EKLISPE approaches
- Regulatory documents and hydrological studies reports

Stakeholders involvement:

- All 2017: Individual interviews
- March 2018: 1srt Workshop
- June 2018: Two focus groups

→ Two more workshops to come

Co-impacts	Subcategories of co-impacts	Potential indicators			Methods
		Physical	Monetary	Socio-cultural	
Quality of habitats	Biodiversity	x		x	Expert judgments Survey
	Water quality and availability	x		x	
	Hydro morphological status	x		x	
Re-development	Ecotourism	x		x	Expert valuation & Survey
	Urban agriculture	x		x	Survey
	Soft mobility	x		x	
Life quality	Recreational activities	x		x	Survey Expert judgments
	Post-traumatic stress			x	
	Home to work journeys	x		x	
	Climate change adaptation/ Air & water quality	x		x	
Social cohesion and territorial coherence				x	Survey

NBS SELECTION (Giving room to the river)

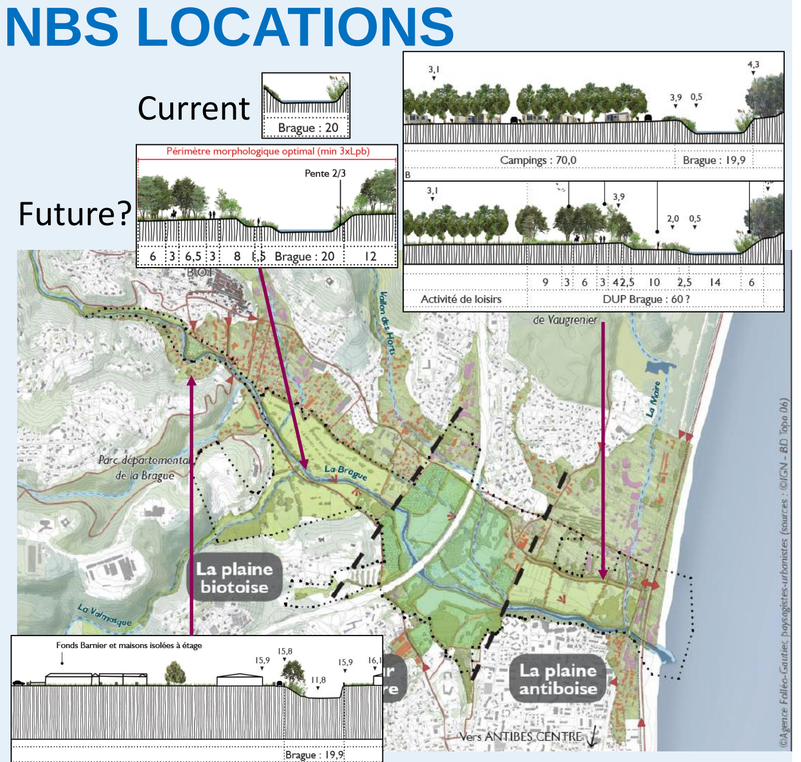
From the experience of the basin agency and on-going studies, and according to the http://nwrm.eu project inventory.

- N03 Floodplain restauration and management
- N02 Wetlands restauration and management
- N05 Stream bed re-naturalization
- N09 Removal of dams and other longitudinal barriers
- N10 Natural bank protection
- F01 Forest riparian buffer
- F10 Coarse woody debris

Main issue: Grey solutions as large retention basins, riprap bank protections, concrete channelization and heavy maintenance of vegetation are the techniques used in the historical approach, in parallel to excessive urban sprawling in the floodplain. Finding a balance between green and grey for the best protection and sustainable level is a tricky exercise.

Advice for other demos: In high risk areas, purely NBS approaches are likely to be insufficient to protect all elements at risk. Hybrid protection plans taking advantage of a balance between green and grey should be studied.

NBS LOCATIONS

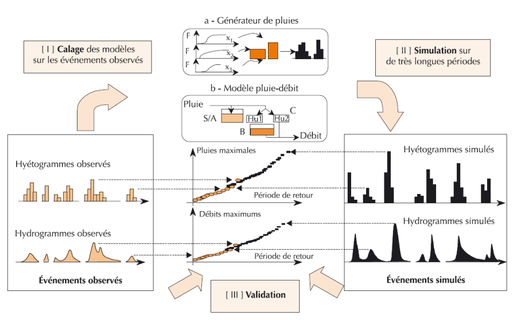


2015's flood → Camp sites closed and expropriation of high risk houses, now what?

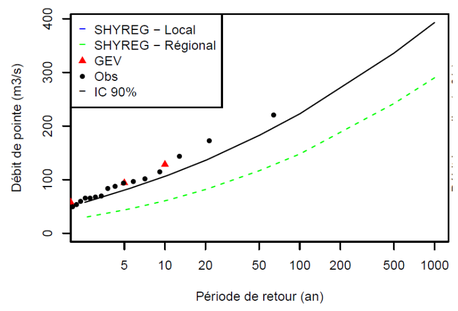
MODELLING

Hydrology

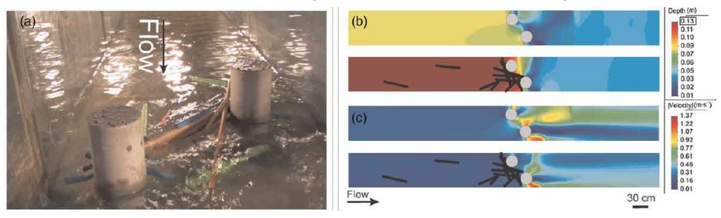
Shyreg (Lavabre et al. 2003, *Ingénierie*)
On-going: wildfire and Landuse effects



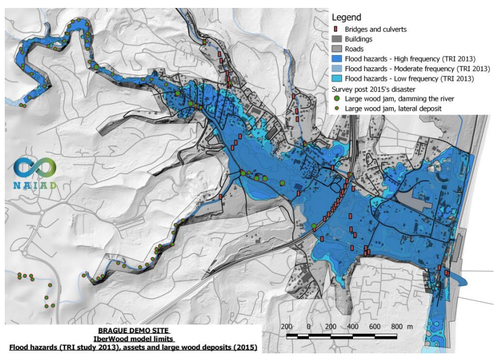
$$Q_{(t,T,basin)}$$



Hydraulics IBERwood (Ruiz-Villanueva et al, 2014, *J. of Hydroinformatics*)



$$Hazards_{(X,Y,T)}$$



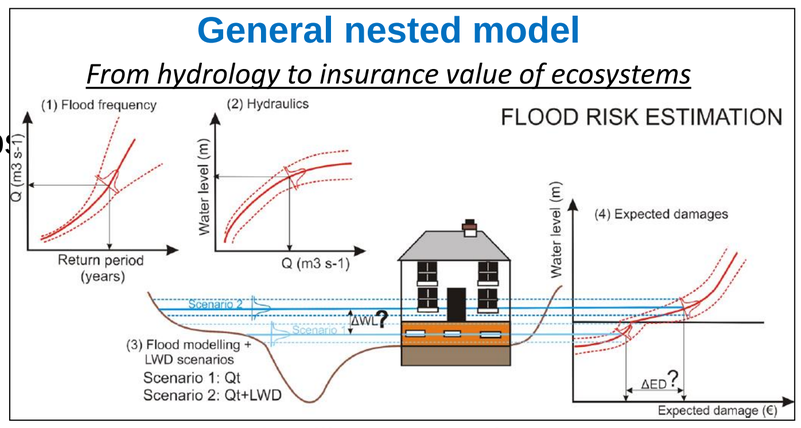
Shallow water 2D equation coupled with the transport of large woods.

Damages (in progress) Fragility curves

- Literature data (in progress)
- CCR database cross controlled with hazards maps

$$Damages_{(Asset,\ Hazards)}$$

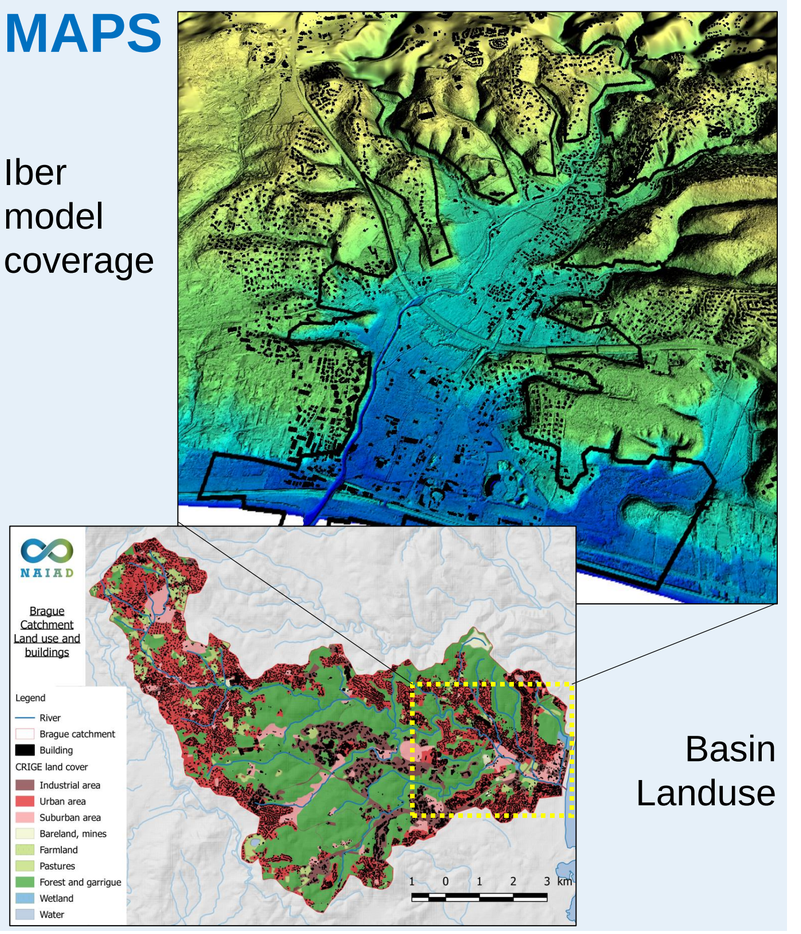
Main issue: Error propagation!



Ruiz-Villanueva et al, 2014, *Nat. Hazards*

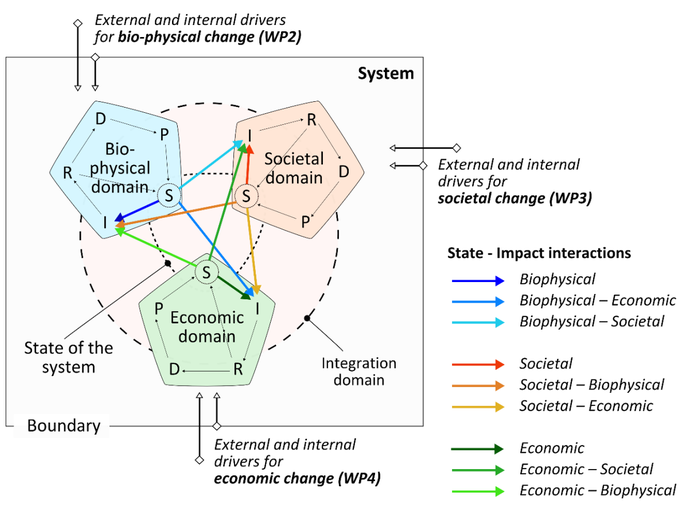
MAPS

Iber model coverage



Basin Landuse

INTEGRATION



A new nested DPSIR approach (EEA 1998)

Drivers: forces that push the system to change its equilibrium. **Pressures:** change the system state and induce impacts. **State**: system components and their status. **Impacts**: are changes experienced by components of the system. **Reactions**: corrective or spontaneous actions following impacts.

Advice for other demos:

The framework can be transfered and use to build transdisciplinary management scenarios.

Domain	Drivers	Pressures	State	Impacts	Reaction
Bio-physical	Climate change	Rainfall, wildfires,	Landuse, soil and vegetation state, protection structures' state, natural hazards	Runoff and erosion, flooding of assets, pollutions, damages to ecosystems, cascading hazards	Building of protection structures, ecosystem maintenance and restoration
Societal	Population growth, urban sprawl	Urban expansion, traffic increase	Risk governance, awareness and perception, crisis management capabilities	Emergency service mobilization, service overloading, evacuation, injuries and fatalities	Risk management, land use regulation, vulnerability reduction measures, risk acceptance and awareness promotion
Economic	Economic dev., Transp. networks	Industrial and comm. dev., investment, profit	Land occupation, population and job locations, maintenance policies	Direct and indirect losses, investments and new maintenance costs	Private sector changes, expropriations, reorganization of the river management, updating of the basin management master plan