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Strategies for managing coupled, dynamic processes in the field of IWRM:

The AQUADAPT project

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Coupled processes ?

Forces acting to transform water utilisation patterns	Forces acting to preserve extant water utilisation patterns
Population growth	Physical infrastructures (pipe networks etc.)
Human migration	Governance structures
Land-use configurations	Links between environmental and commoditised water system integrity
Economic development	Economic (i.e. sunk cost) & technological 'lock in'
Changes in agricultural practices and crop mixes	Topography and catchment boundaries
Public awareness of water management issues	Public health concerns
Water saving and recycling opportunities	Profitable ownership patterns
Climate change	

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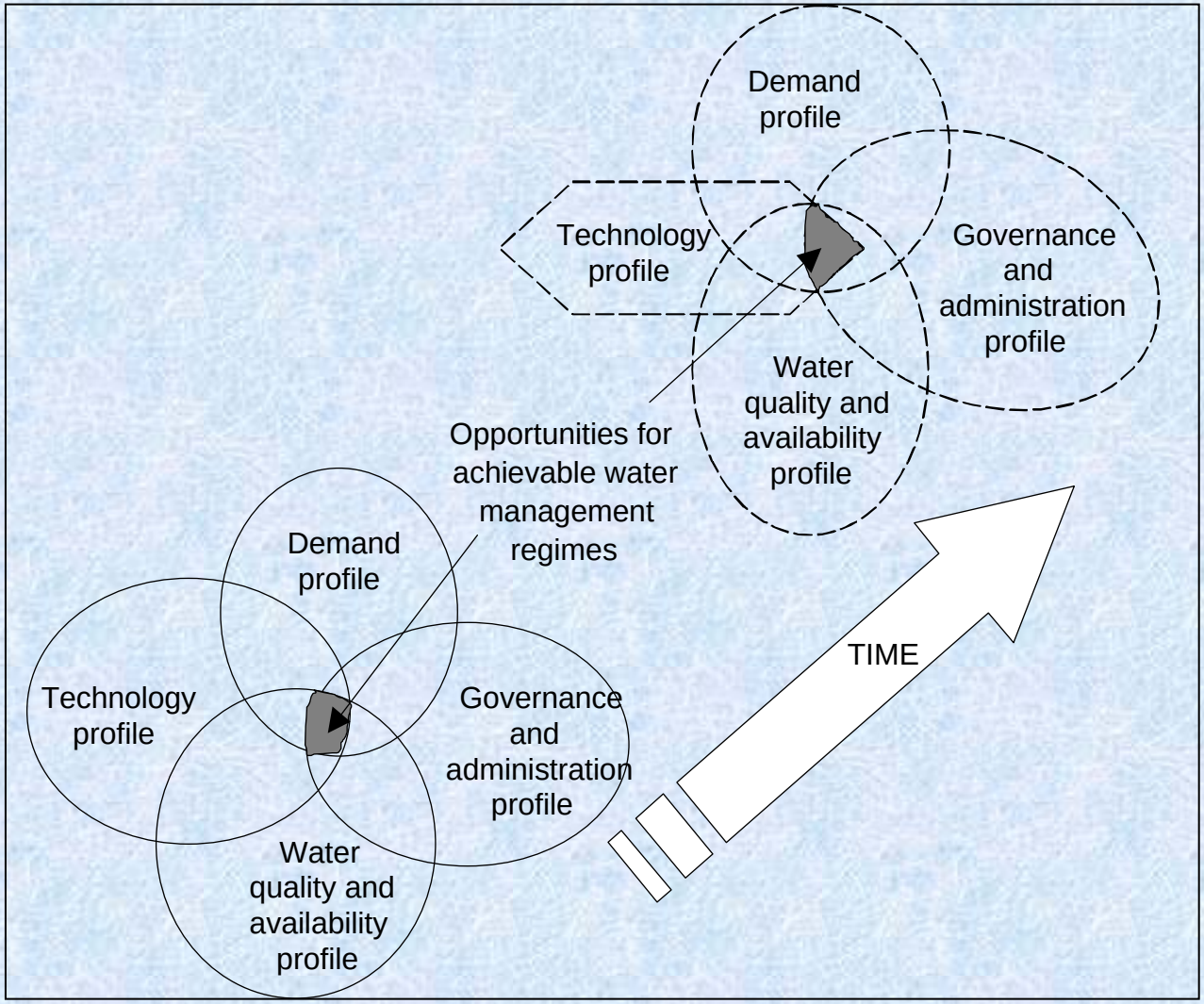
Changing opportunity spaces



How is 'Aquadapt' different ?

- Focused on long time horizon transitions - Adaptive responses to increases in water stress (in terms of both quantity and quality)
- Well bounded and largely disciplinary focused workpackages – the science is not obscured by excessive cross-disciplinary baggage !
- Includes assessment of theoretical structure adopted – 'co-evolutionary processes'.
- Accepts that appropriate policy responses to water stress might involve economic, social, structural or governance elements – i.e. the answer might not be to do with water !

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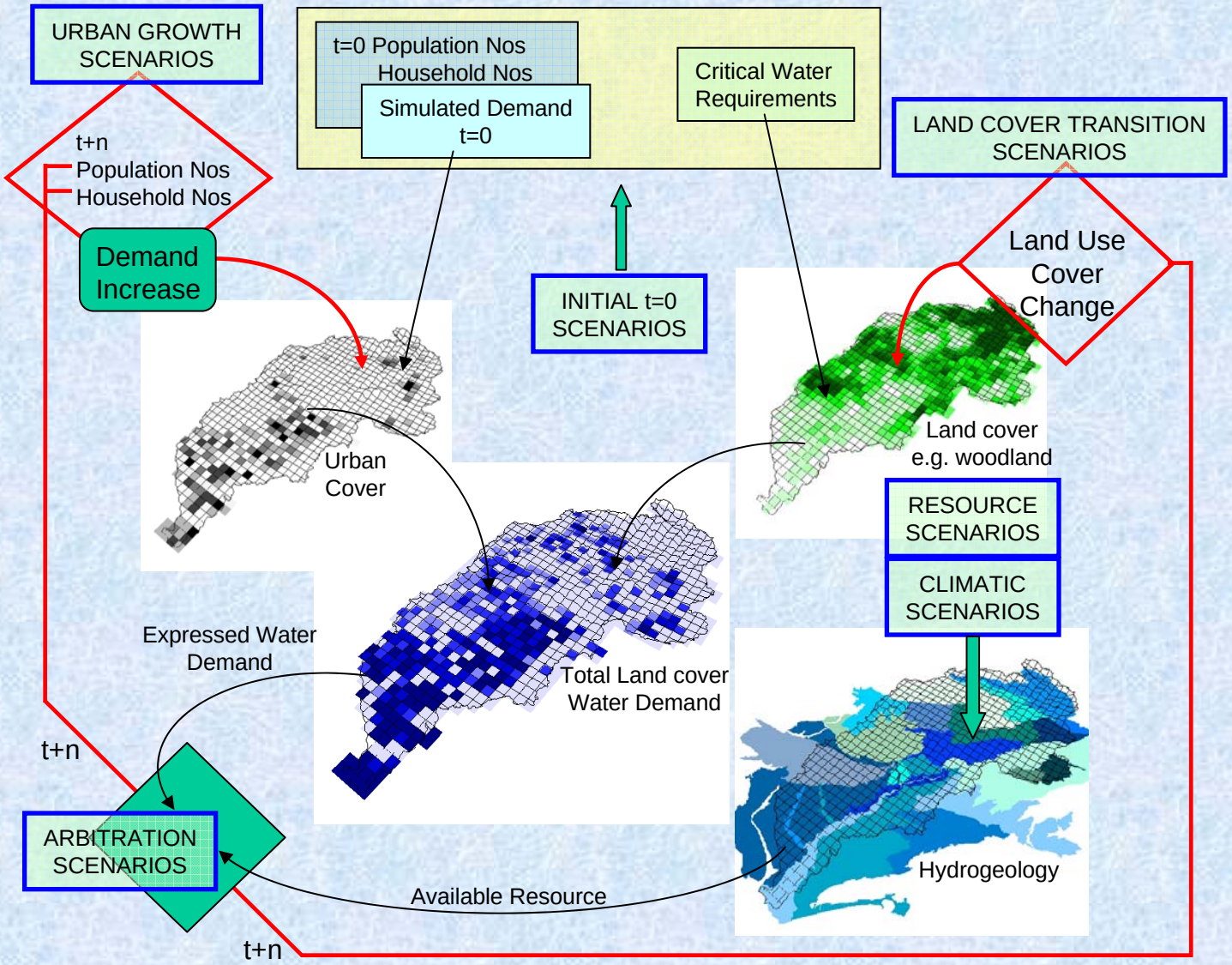
Simulation modelling of hydraulic flows and uses in the Herault valley, France



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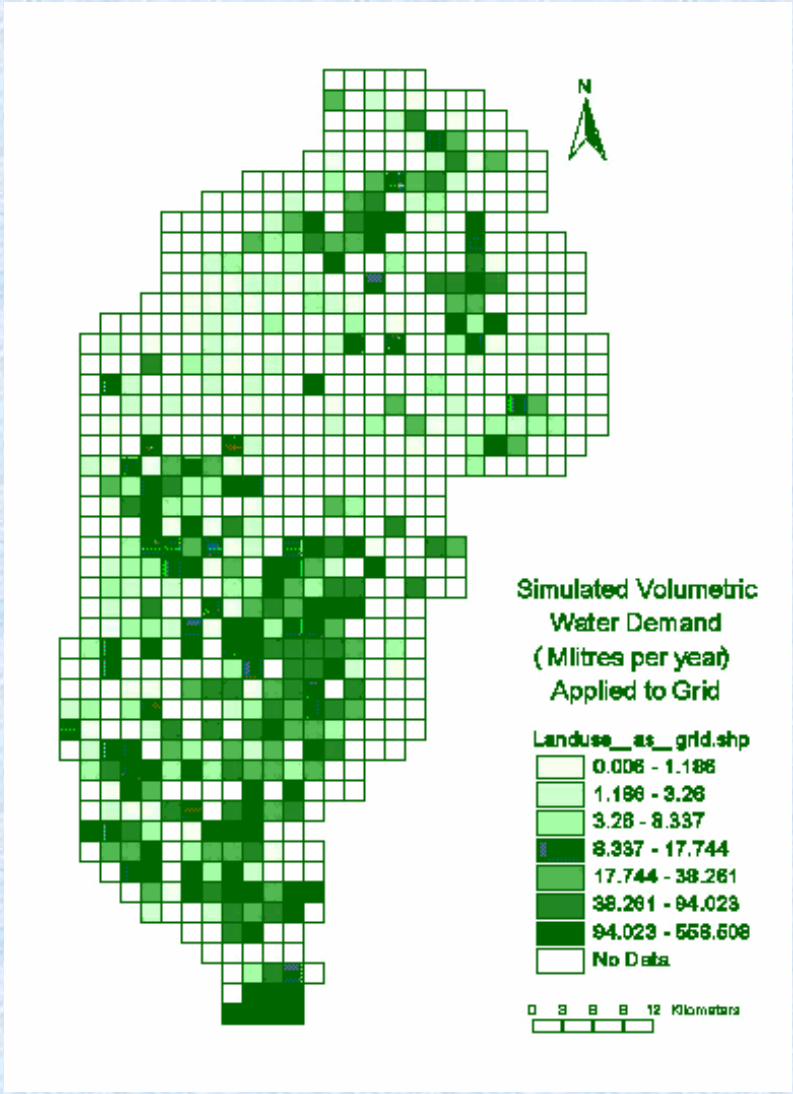
Water Use Profile Model



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Land Use Change Model

- 14 landuse classes from SPOT
- Three groups:
  - Autogenic landcover (e.g.Grassland, Forest)
  - Allogenic landuse (e.g. Vineyards, arable crops, Urban fabric)
  - Static: (e.g. Water bodies)
- Critical Water Requirements for autogenic landuse

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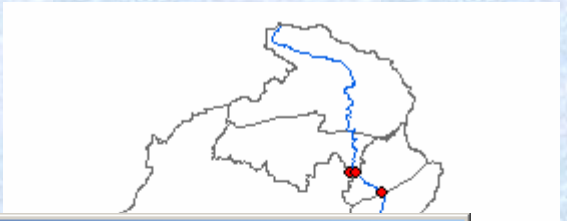
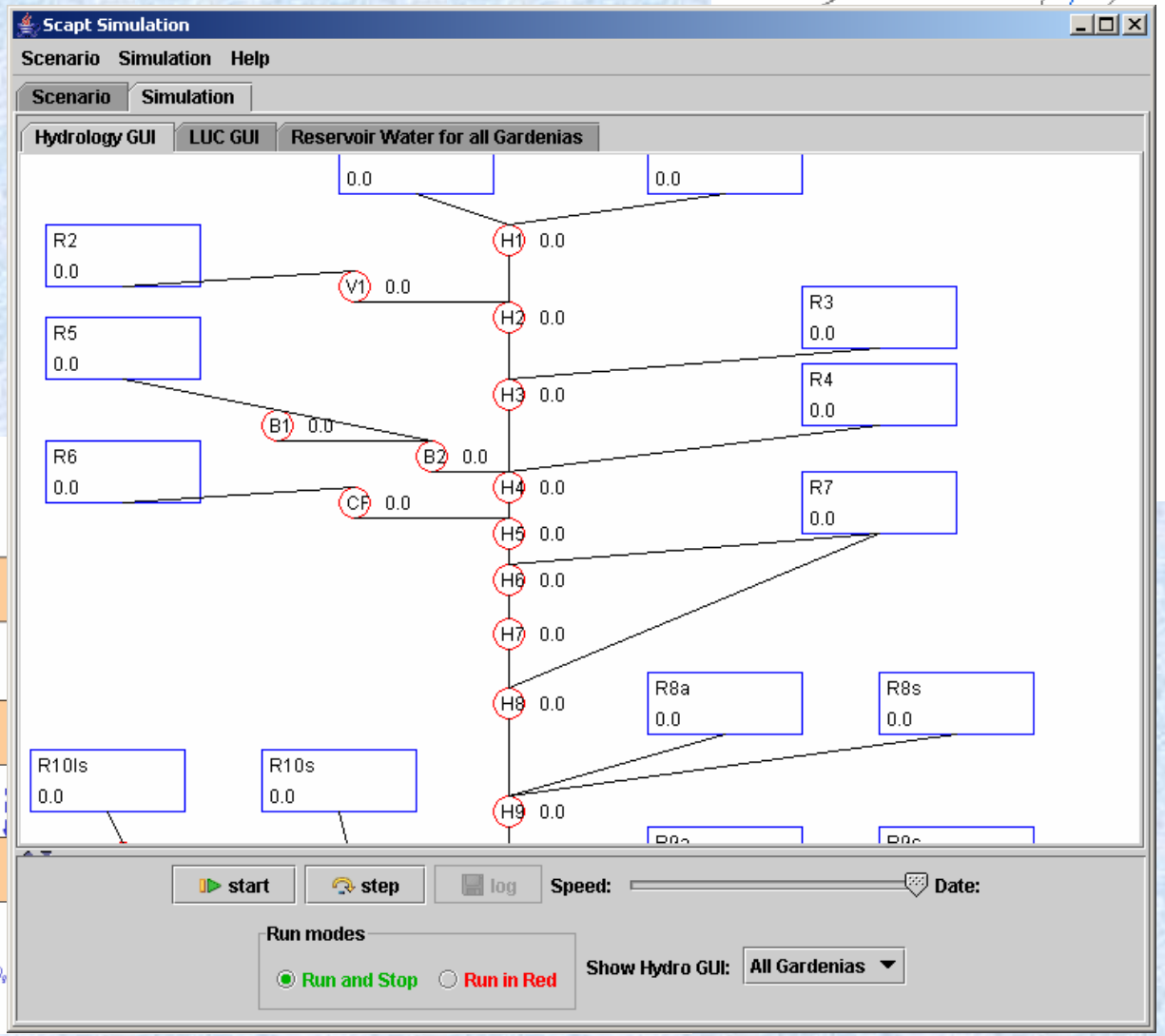
Hydrological Model





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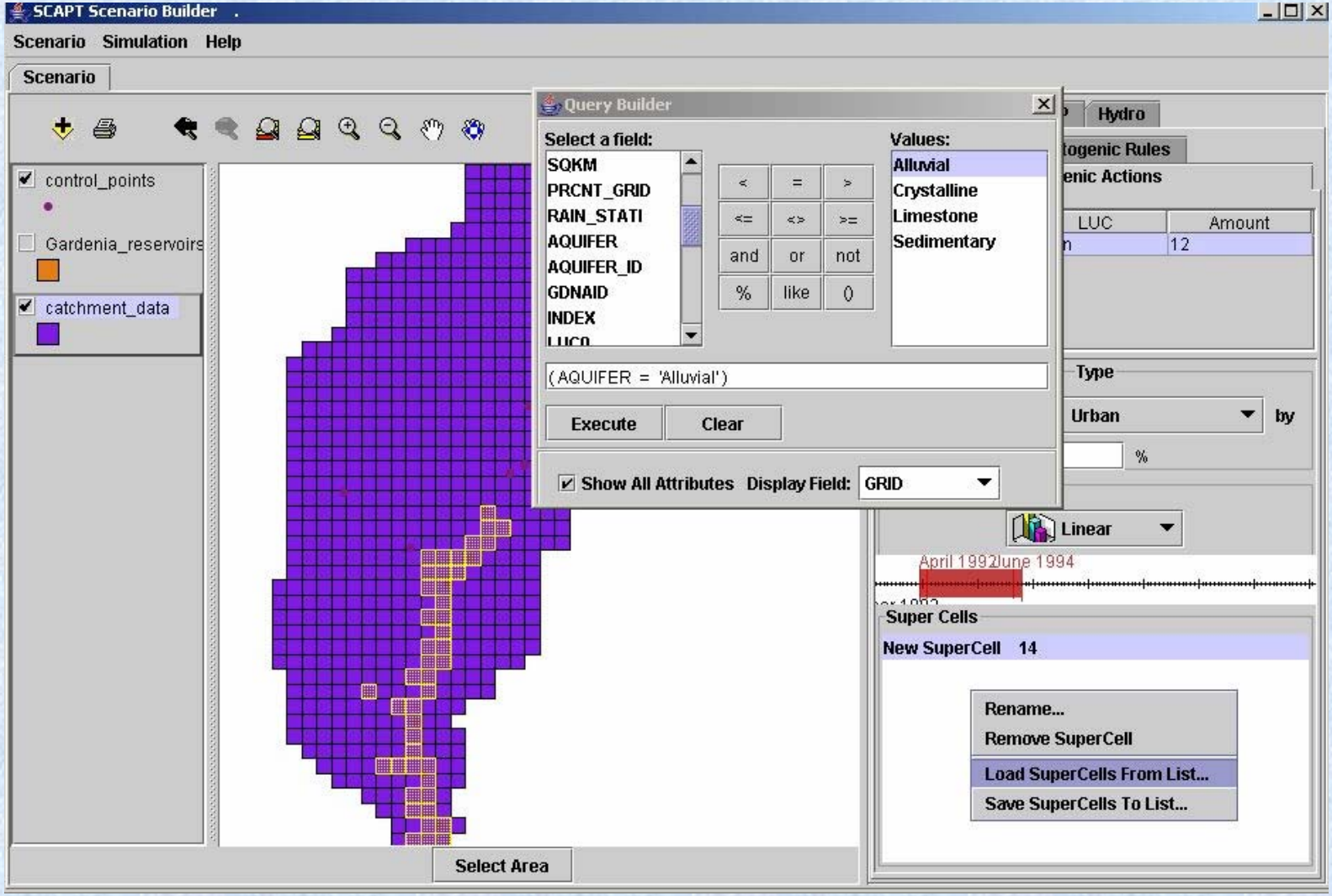
Scenarios



Citizens' willingness and ability to modify water use behaviour: four European case studies

CASE STUDY	No. of INTERVIEWS	
River Nene catchment (UK)	396	Household face-to-face interviews
Hérault river basin (France)	400	
SW of Slovenia	421	
Marina Baixa (Spain)	411	
TOTAL	1,628	

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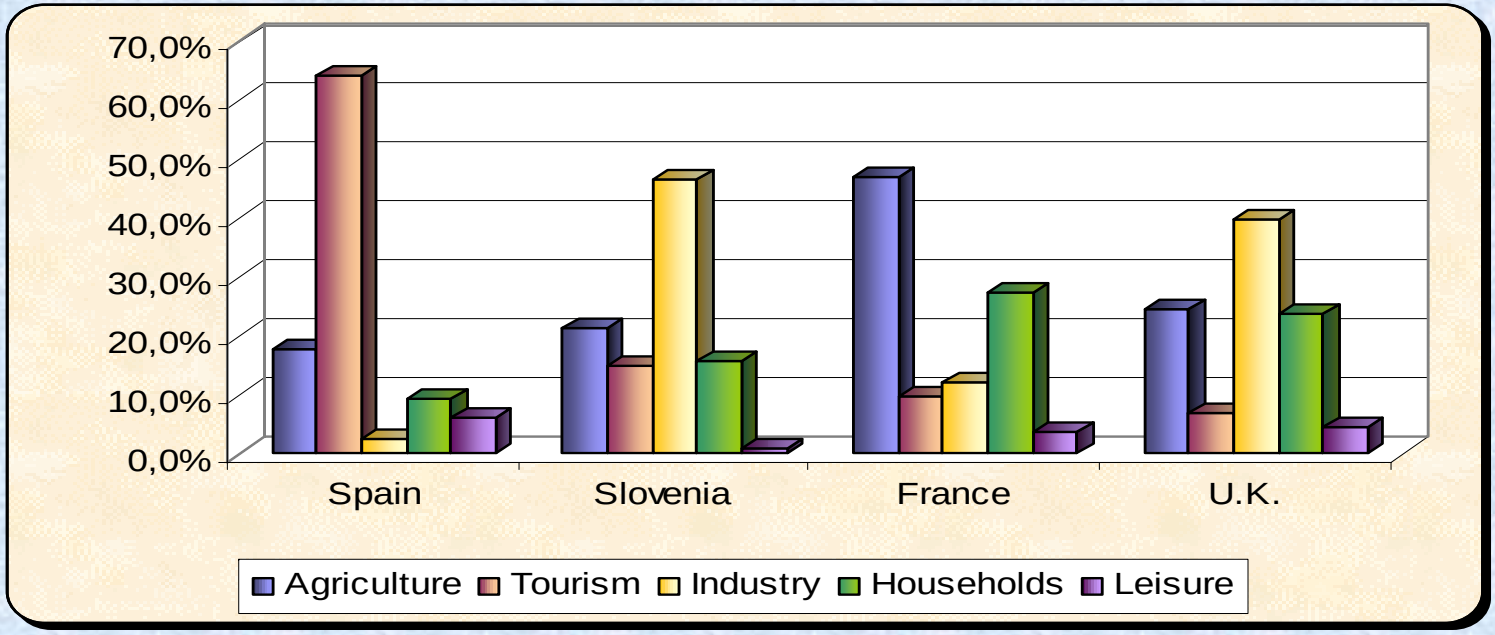
Please select from the following five categories of water user in your country, the one you consider to be the highest consumer of water by volume.



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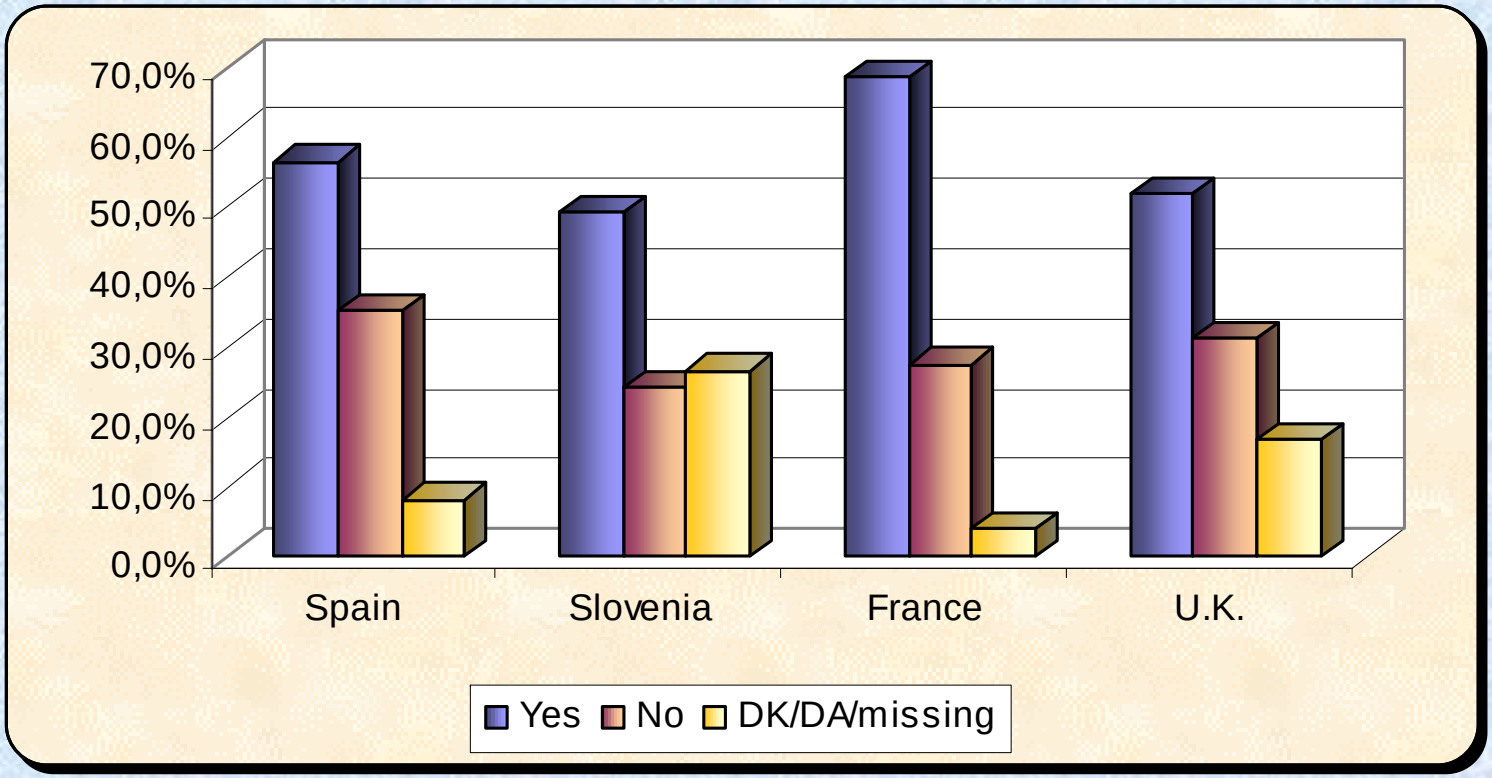
If a pricing system based on peak use were to be introduced, would you be willing to consider using smaller amounts of water during peak hours and instead switch most of your water use (i.e. garden watering, dishwasher, washing machine and baths) to off-peak times during the day and later at night if it saved you a quarter of your normal household water bill?



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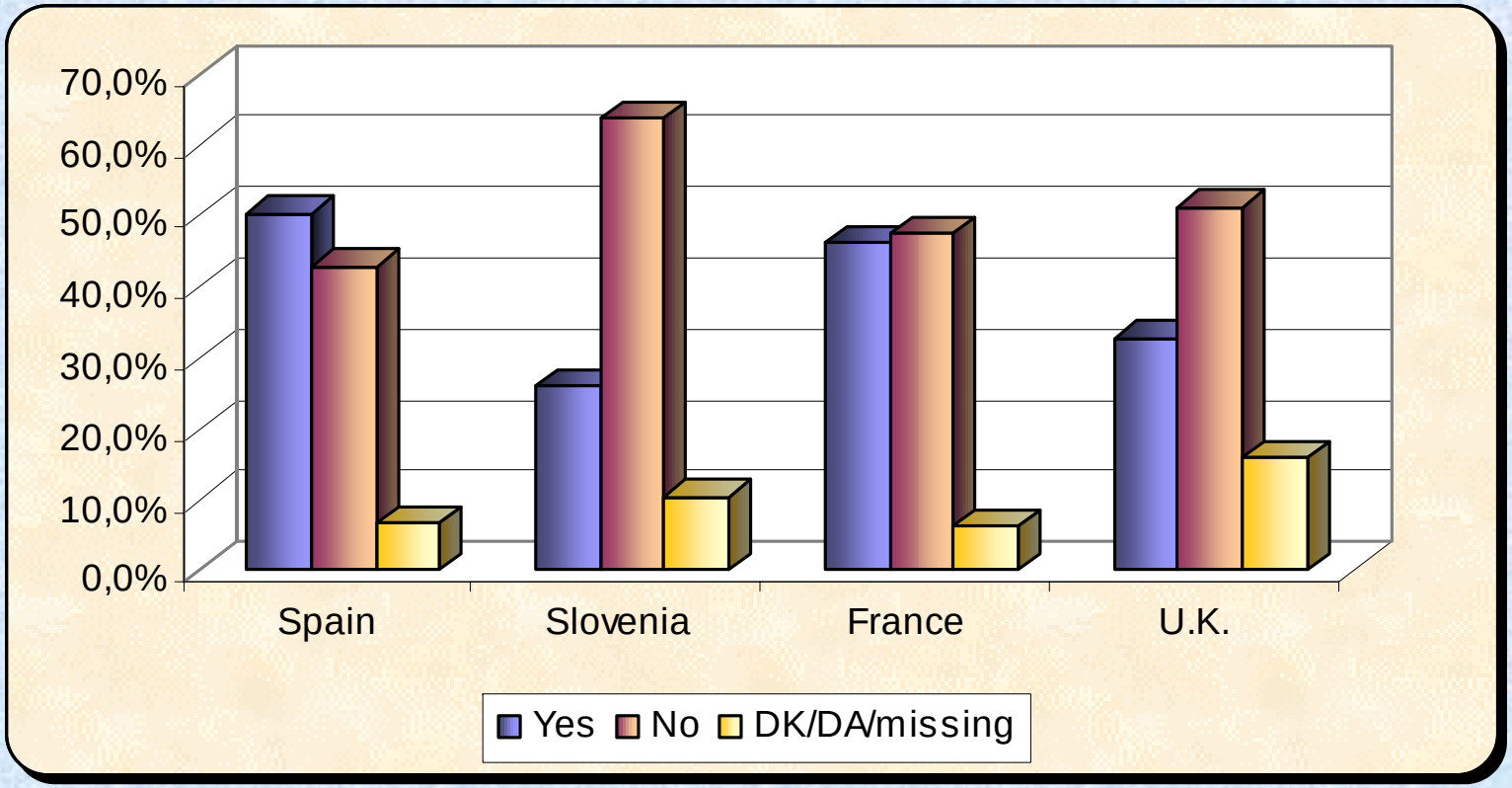
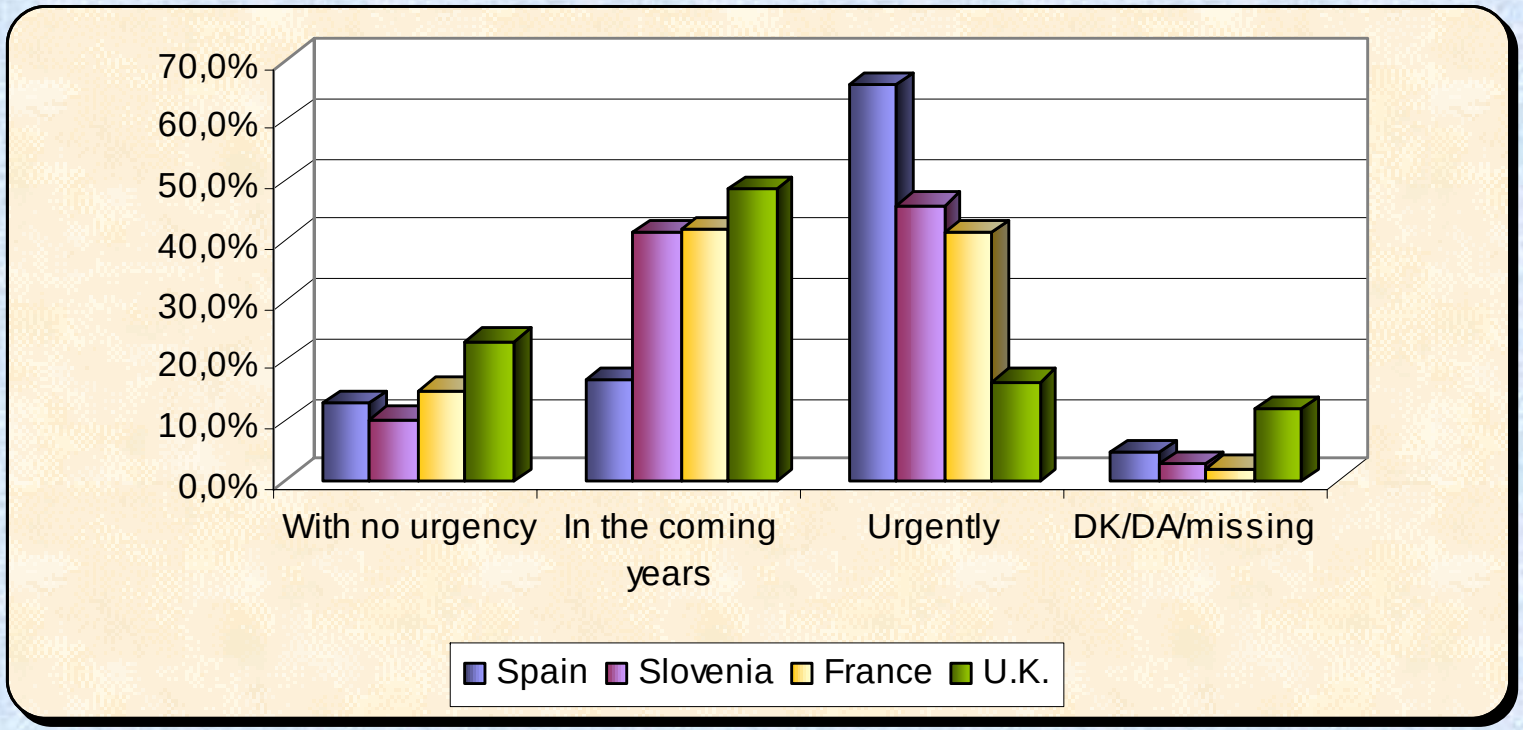
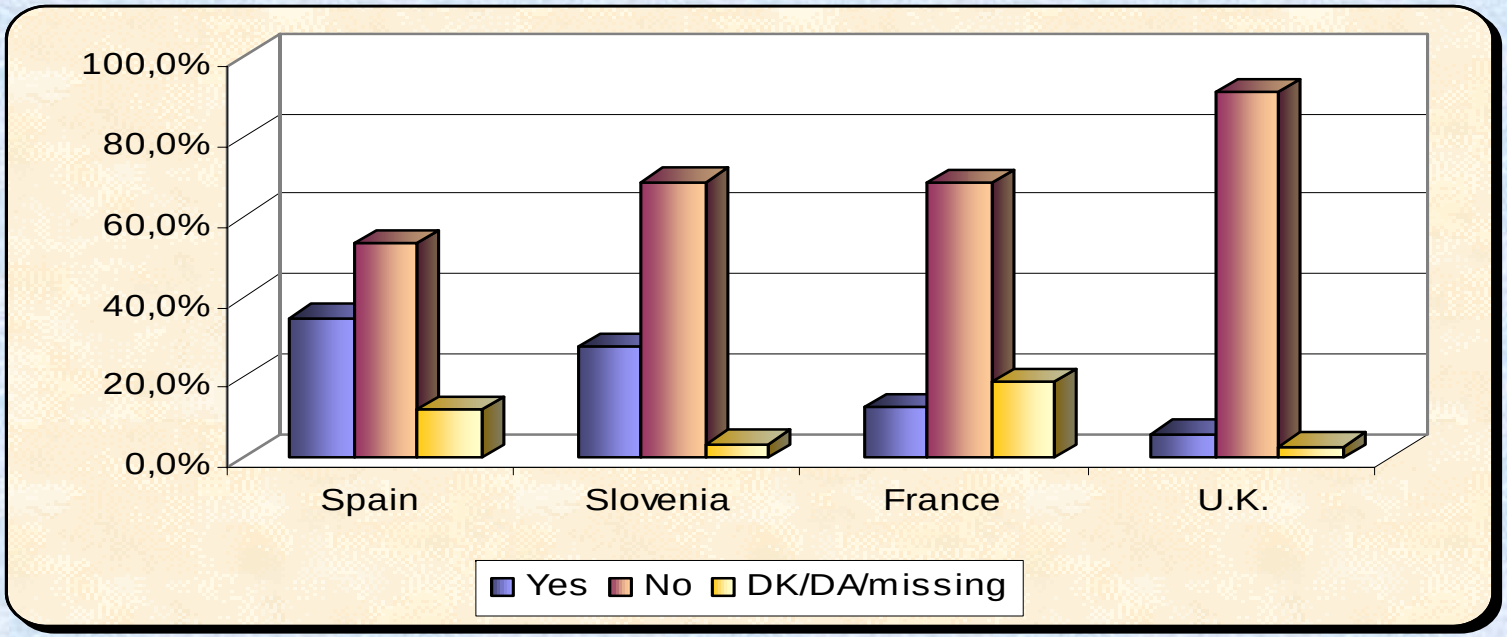
If your normal water bill was projected to increase by a quarter, do you think you would take measures to reduce your consumption?



Is water resource management in your local area an issue that needs to be addressed…?



Would you like the opportunity to be involved in discussions and debates on the present and future management of water resources?



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Water governance; looking for evidence of adaptive response in four European catchments

- Studies carried out in the Jucar (Spain), Maas (Netherlands), Nene (UK) and Herault (France) basins.
- Most changes to water governance arrangements initiated by political or ideological ambitions (increasing administrative / financial efficiency) rather than by water management issues
- Cases where adaptive response has been initiated by local water management issue characterised by high rates of change in the drivers of water stress.

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Coupled hydrological and land use changes in the Marina Baixa, Spain.

Catchment area: 641 Km^2

County area (18 municipalities): 578,5 Km^2

Digitized study area : 680,7 Km^2

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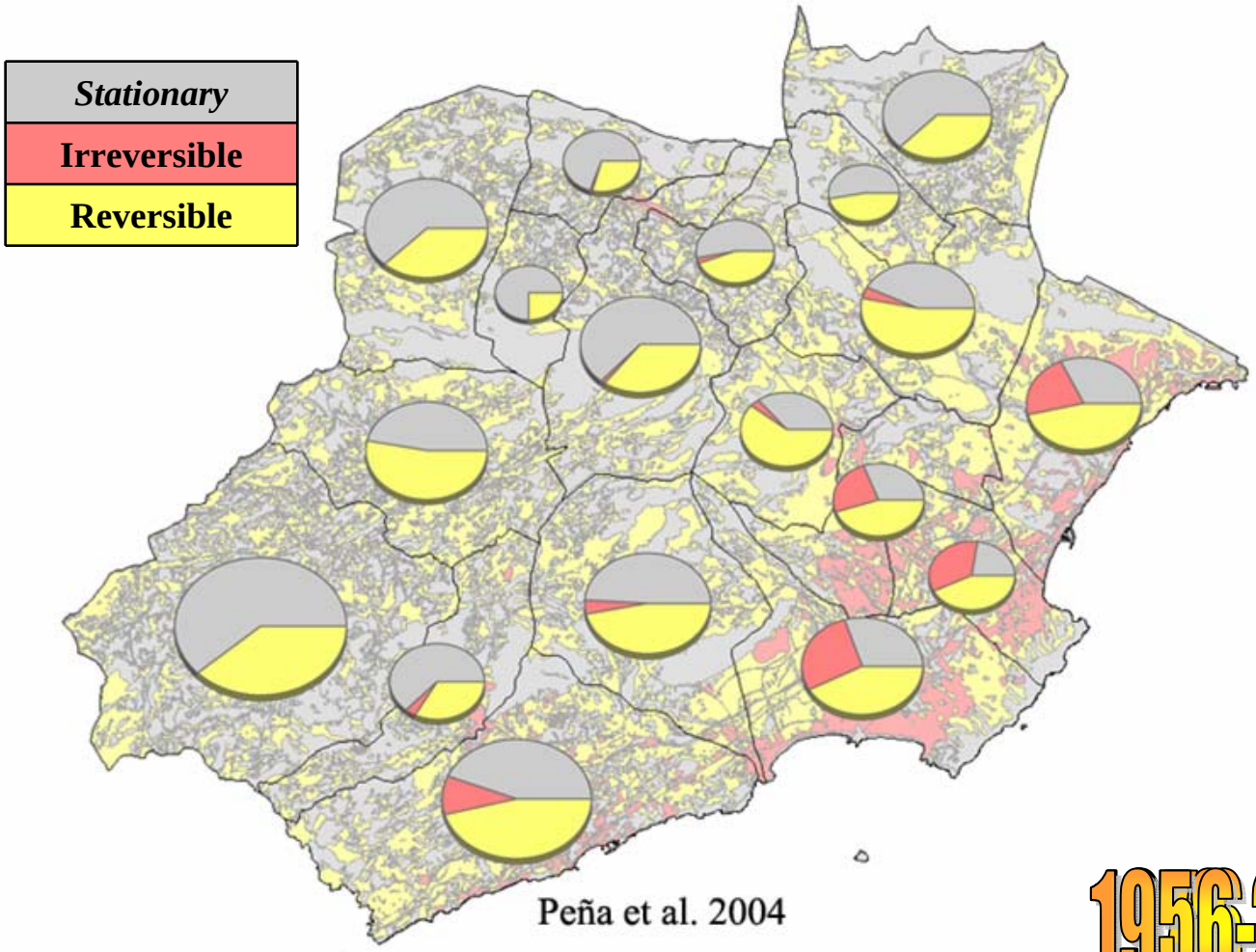
Irreversibility of land use changes



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LU/LC categories qualitative markovian transition matrix

		Water bodies	Bare soil or ground	Artificial surfaces	Non-irrigated arable land	Irrigated arable land	Woodland	Shrubland/ herbaceous
	Water bodies	*Stationary*	Aggradative	Degradative	Aggradative	Aggradative	Aggradative	Aggradative
	Bare soil or ground	Degradative	*Stationary*	Degradative	Degradative	Degradative	Aggradative	Aggradative
	Artificial surfaces	Aggradative	Aggradative	*Stationary*	Aggradative	Aggradative	Aggradative	Aggradative
	Non-irrigated arable land	Degradative	Degradative	Degradative	*Stationary*	Degradative	Aggradative	Aggradative
	Irrigated arable land	Degradative	Degradative	Degradative	Aggradative	*Stationary*	Aggradative	Aggradative
	Woodland	Degradative	Degradative	Degradative	Degradative	Degradative	*Stationary*	Degradative
	Shrubland/herbaceous	Degradative	Degradative	Degradative	Degradative	Degradative	Aggradative	*Stationary*

In terms of sustainable growth:

Stationary	Changes between same ecological quality
Aggradative	LU/LC more sustainable transitions
Degradative	LU/LC less sustainable transitions

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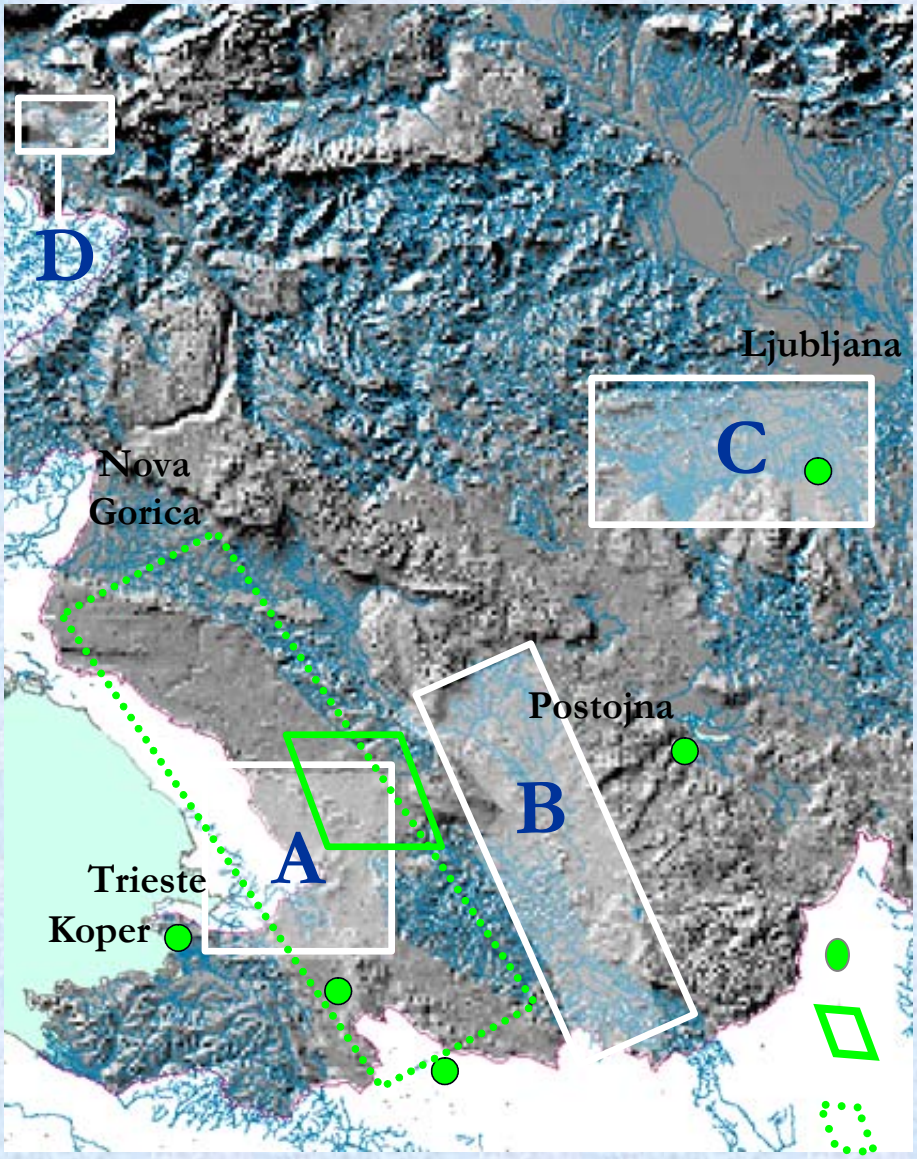
Archaelogy on the Karst landscapes of Slovenia



Archaeology :

A- Neolithic

B- Bronze, Iron and Roman Ages

C- Neolithic

D- Late Antiquity

Palaeo-environment :

- Palynological coring

- Soil excavations from limistone sinks

- Forest story (synthesis)

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An adaptive capacity perspective on long term water management issues

1. **The gaps between policy fields** – we understand little of the modifying impact of policy mechanisms in one area of governance on other areas – need for 'joined up governance'
    - Collaboration needed with governance & regulatory bodies
    - Tensions between 'sustainable X'

2. **Sustainable water livelihoods at catchment scale** – evaluation of the water carrying capacity of a catchment based on renewable water availability – envisioning and trade-off analysis to identify specific industry – agriculture – environment – society water use configurations.
    - South – North knowledge transfer … scenario building
    - Focus on inter-community resource management

3. **Policy mechanism change (i)** –the effectiveness of different policy mechanisms (e.g. pricing, education, regulation) is significantly influenced by social and cultural contexts. The ways in which issues of legitimacy, trust, and social capacity (the ability of communities to respond to policy mechanisms) impact on policy mechanism change are poorly understood.
    - More involvement from social sciences
    - Lessons from NIS region

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4. **Policy mechanism change (ii)**
   The relative effectiveness of specific policy mechanisms to address water stress will depend on an understanding of the temporal profile of mechanism impact.
   - More work needed on 'time to deployment and impact'.

4. **Lock-in** – Adaptive management practices require deeper understanding of how and why communities become locked in to 'ways of managing water' …. and more importantly, under what conditions this is beneficial and when is it not + how can they break out of such relationships.
   - Lessons from history

5. **Water value profiles through catchments** – the economic, social and cultural value of water to different user groups will vary across a catchment as a function of water quality and availability – can economic value be traded off against social or cultural value ? can we configure water supply systems to add value ?
   - Will require extension of hydrology based IWRM modelling
   - More understanding of cultural significance of water and how it supports lifestyles

6. **'End game' management** – what do we do when there is no more water ?
   - Lessons from history
   - Radical social & technological responses

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