


**Joining up the dots – *how hydrogeologists can play a key role in catchment management***

**Bob Harris**  
 Catchment Science Centre,  
 University of Sheffield  
 and DTC Secretariat, Defra

Demonstration  
 Test  
 Catchments



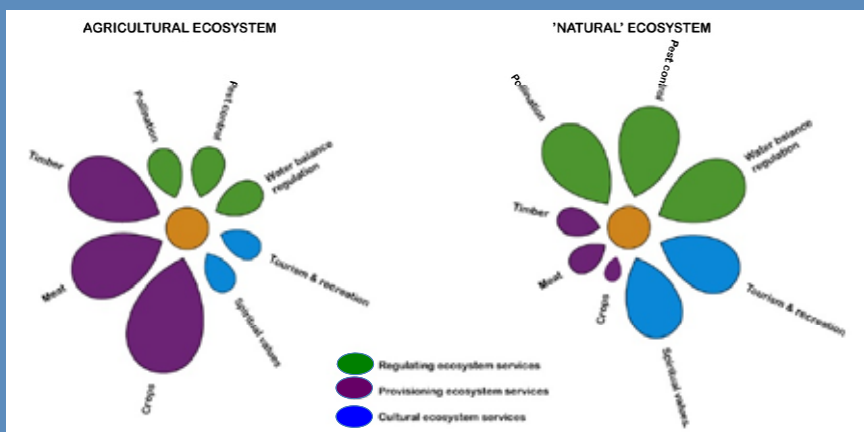

The world is changing - more complex, connected... & confusing

- A changing world
  - Climate, economy, values, food/energy distribution etc
- A more complex world
  - Recognition that things affect each other
  - Recognition that we don't understand – financial or environmental
- A more connected world, *but we don't know how...*
  - Our sense of scale has changed; the sense of place
  - Recognition that global issues affect local scales

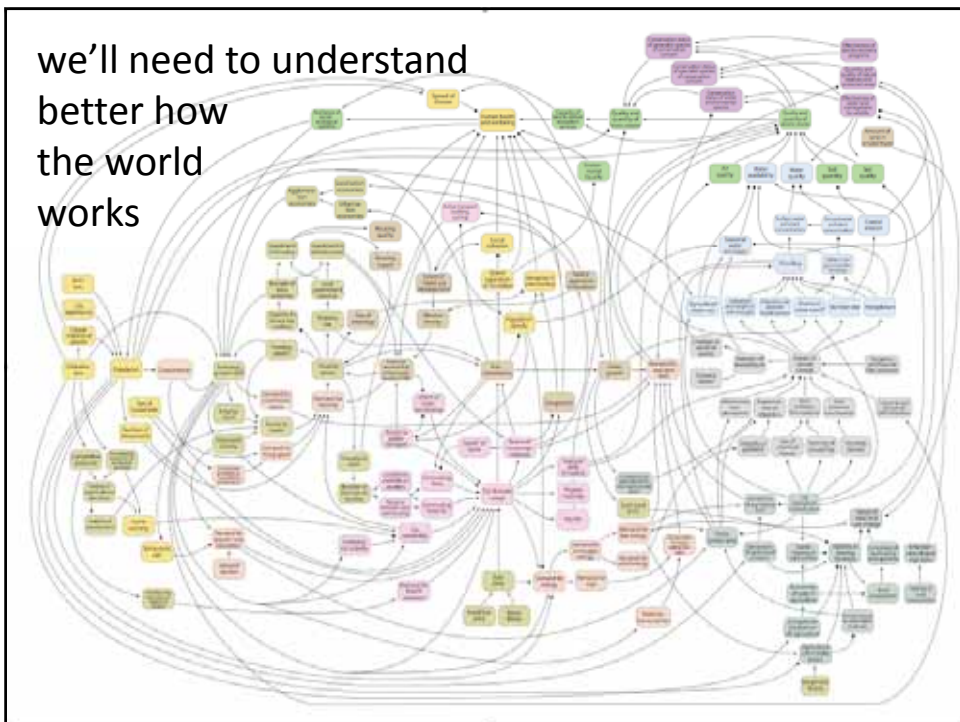


- The earth's population is expanding - fast
- The demands are greater (both basic and aspirational) – our exploitation of one 'cheap' resource affects the availability of others
- The climate's changing quickly with huge uncertainties to the consequences and uneven impacts.
- Global markets drive economies and lives – but changes happen in unforeseen ways through remote decisions

## Ecosystem Services – out of balance

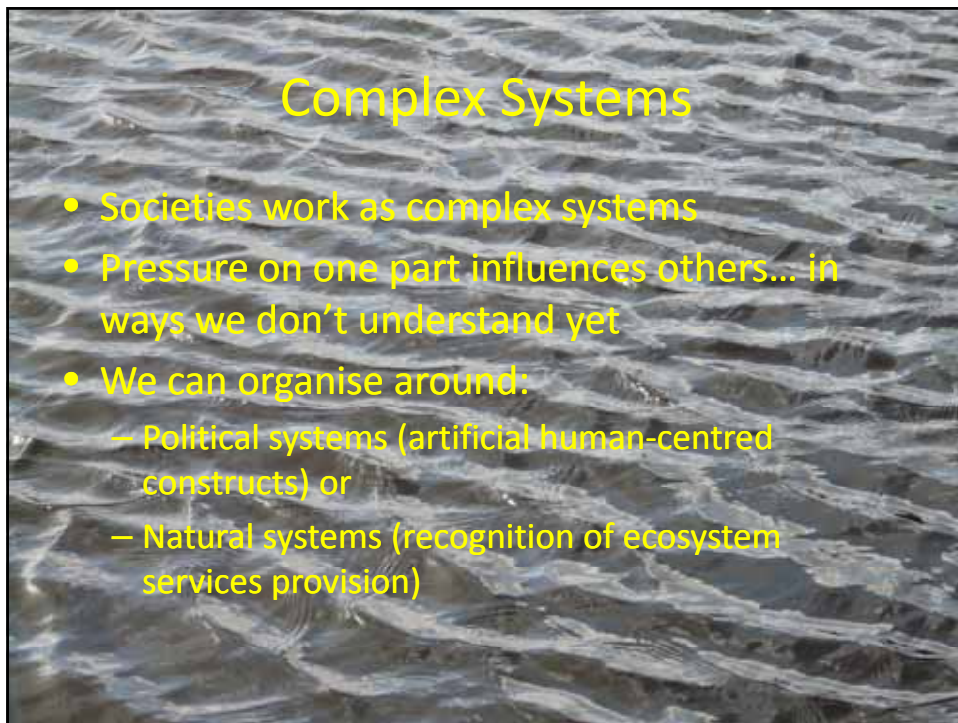


Slide courtesy of West Country Rivers Trust

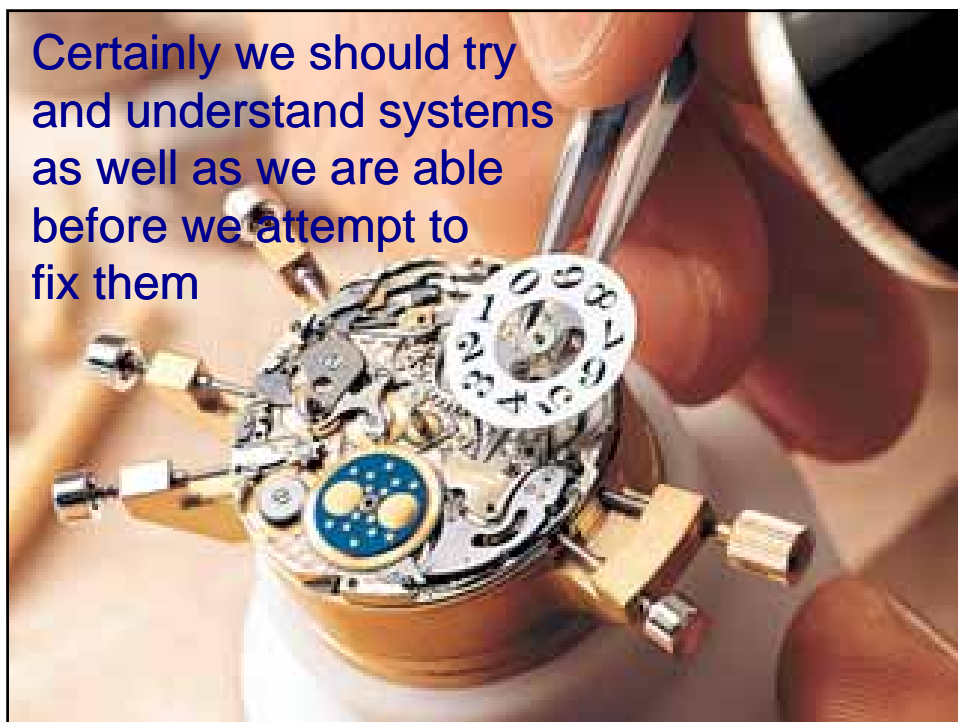


## Complex Systems

- Societies work as complex systems
- Pressure on one part influences others... in ways we don't understand yet
- We can organise around:
  - Political systems (artificial human-centred constructs) or
  - Natural systems (recognition of ecosystem services provision)



Certainly we should try and understand systems as well as we are able before we attempt to fix them





## Water Framework Directive - 2000

- **It's still new!**
  - Risk-based (sets objectives not procedures)
  - All embracing (includes all waters and by inference involves land management)
  - Ecosystem-centred (Good Ecosystem Quality the ultimate target)
  - Sets the geographical boundaries – natural not artificial, political ones
  - Participatory (River Basin Planning process)
- **It's still challenging – not least the scale issues!**

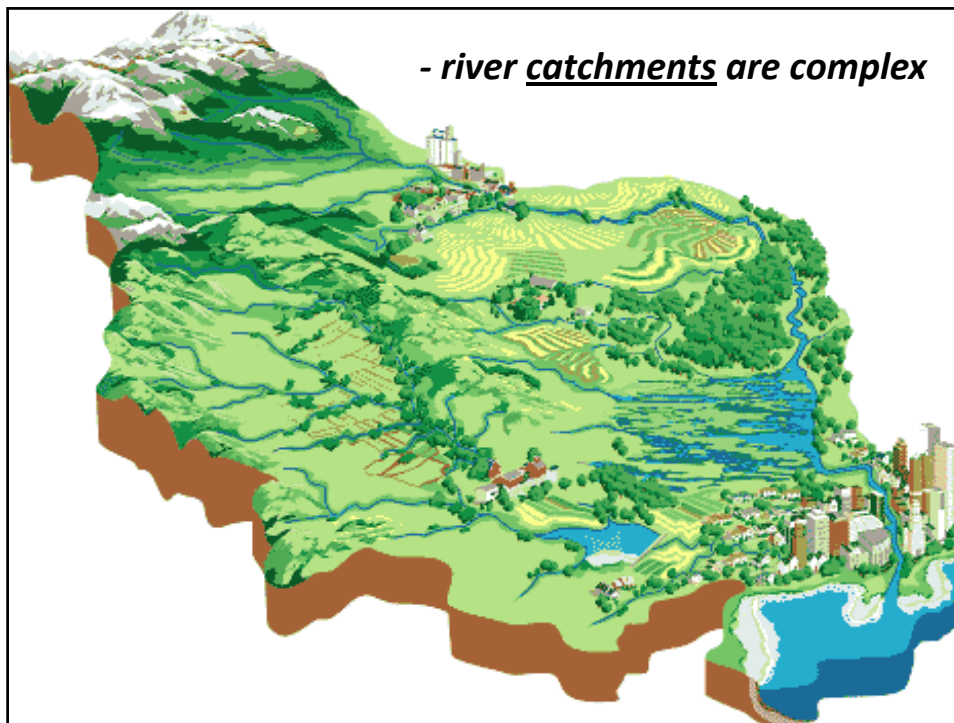


*“... there is a clear appetite for a more integrated, holistic and Big Society approach to managing our water environment.*

*... catchment management based approach to implementing the WFD will focus on delivering multiple environmental benefits and bring together all the relevant players to decide on what these should be and how we attain them.*

*It is certainly not just about meeting EU objectives. It is about trying to enhance the local environment for people, businesses and for wildlife.”*

Richard Benyon, Environment Minister, 22 March 2011

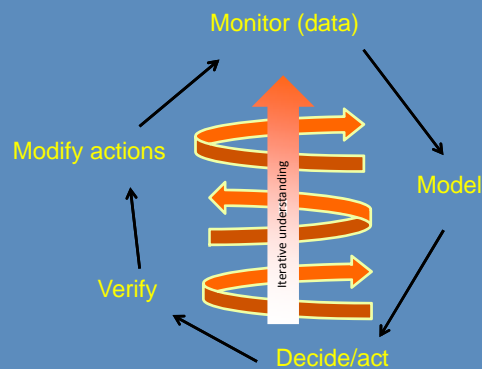


## **A brave new world of integrated catchment management**

- Government has said it wants a 'catchment-based approach' for the 2<sup>nd</sup> round of WFD River Basin Plans;
- Needs to be an adaptive, collaborative, participatory, more holistic process
  - decisions need to be understood; win-wins and trade-offs negotiated.
- We will need people who can both understand the processes and the broader context of environmental management

## Understand before we manage, but we can never understand everything fully – how much certainty is required?

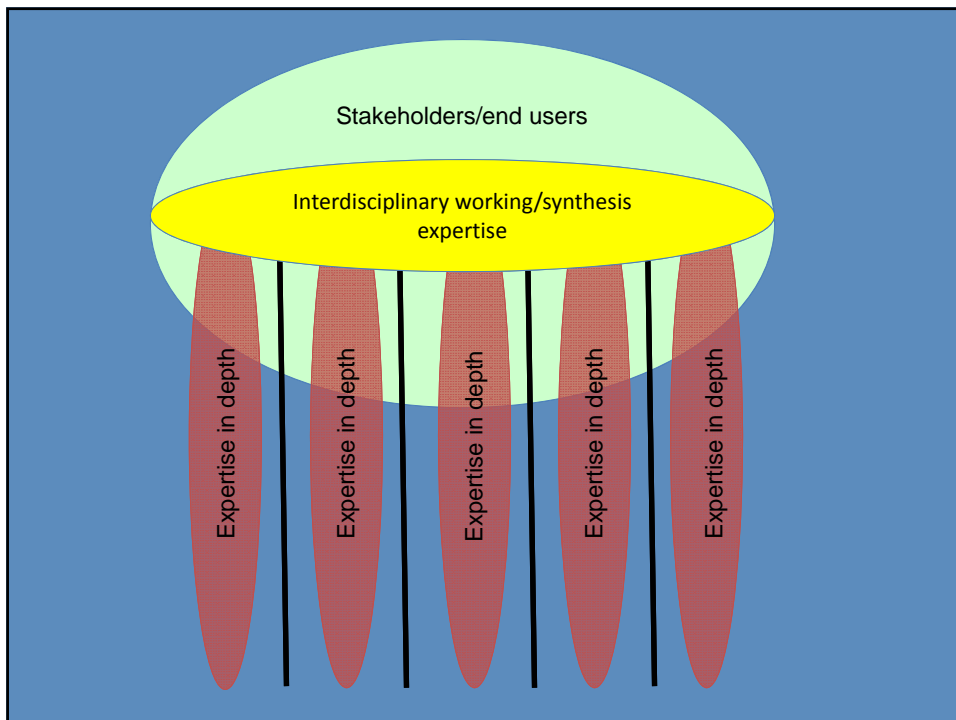
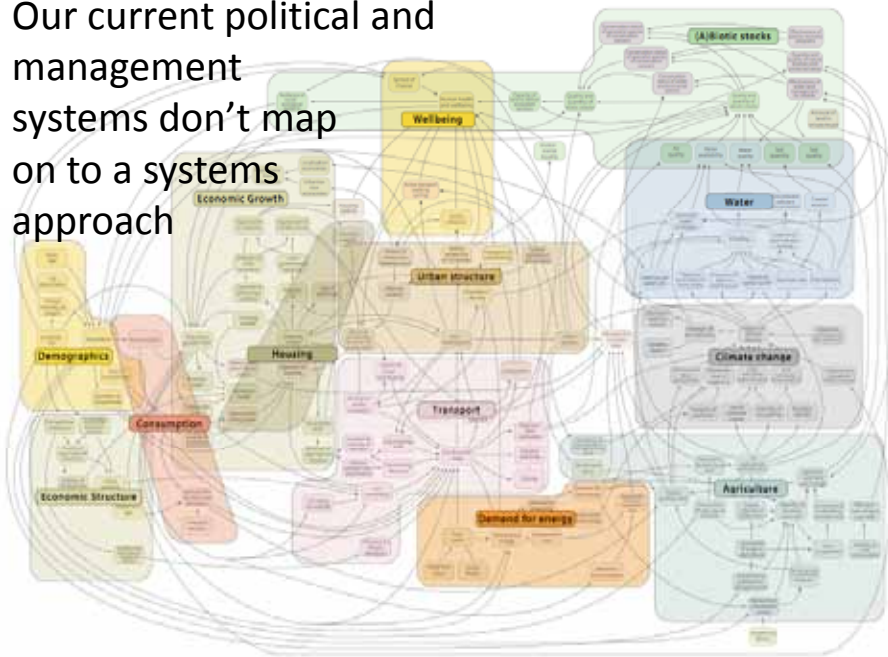
Developing understanding is an iterative process that must be linked to adaptive management



## Integrated Systems require integrated understanding and integrated management

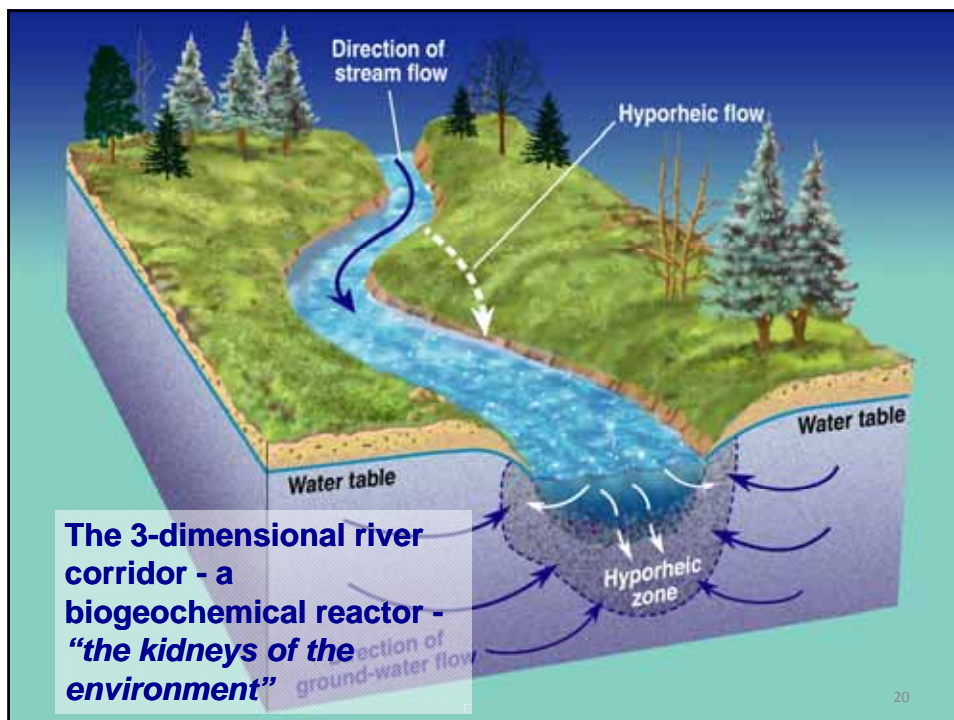
- More multidisciplinary science teams; more interdisciplinary scientists
  - *some (not all) need to climb out of the box; most need to 'learn a different language'*
- Joined-up policy – within and between the layers:
  - *Still largely driven by separate strands of legislation which create policy chimneys*
  - *In Lower Saxony, 20 years of reducing nitrate in groundwater through the local Water Co working with farmers has been reversed by Federal policy of growing increased biofuel crops... like high nutrient demanding OSR*

Our current political and management systems don't map on to a systems approach



## So how will hydrogeologists be useful in this new joined-up world?

- Hydrogeologists are used to:
    - working at different scales and in four dimensions,
    - having no data,
    - thinking holistically,
    - conceptualising the environment they are dealing with, and
    - working with models,
- all attributes that are needed in systems understanding.



## Modelling Approach?

- Monitoring, data and modelling all inseparably linked;
- Environmental managers thinking in 4 dimensions about how their world works
- Conceptual models are an everyday tool embedded in everyone's thinking
- Iterative approach to understanding and decision-making involves all sectors
- Linking environment with socio-economics
- Model outputs user friendly and not feared



Demonstration  
Test  
Catchments

- Building a new way of doing research; a new way of working
- Collaborative and participatory

Thank you for  
listening



