Integrating Science and Governance for Catchment Management

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The catchment management problem:

How to protect and manage water resources in a catchment in which people can live, work and play?

A complex problem?

A ‘wicked’ problem?
Objectives:
1. Comparative analysis of international catchment management experience
2. Investigation of if and how lessons can transfer to UK
3. Two case studies: Upper Tamar, SW England and Upper Thurne, East Anglia
4. Development of guidelines

Wicked problems:
- complex
- dynamic, uncertain
- diverse legitimate values and interests
- no definitive problem formulation
- many externalities
- multiple trade-offs
- intractable for a single organisation

(Rittel & Webber, 1973) (Ludwig, 2001)
Catchment management challenges

- inter-related problems of water quality, over abstraction and flood risk
- pollutant sources are numerous, dispersed, with multiple & uncertain pathways & attenuation
- problems are multi-sectoral
- monitoring and regulation are relatively costly
- polluting activities produce food, rural jobs, tourist income etc.
- how to share costs?
- how to capture benefits & fund improvements?
**Catchment management concerns**

- household septic systems
- sewage treatment works
- soil loss in construction
- stream corridor management
- restoration of river morphology and wetlands
- road runoff and urban runoff
- water supply
- other waste management
- spatial planning and economic development
- education and awareness raising
- research, monitoring, modelling

A mix beyond the capacity of one organisation, needs collaboration and coordination
**Project scope and activities**

**Strand B:** 2 UK case study catchments, Upper Tamar, Upper Thurne

1. Identify stakeholders, partnerships, issues and goals, seek consensus
2. Characterise and understand the catchment: use decision support tools
3. Finalize goals and test management scenarios with stakeholders, assess physical, economic and social impacts
4. Assess implementation options and possible governance arrangements

**Strand A:** comparative analysis of international catchment management programmes

- Learn lessons for working with partners & stakeholders, analysis, monitoring, governance and policy

**Catchment management template**
A ‘wicked’ diagnosis for catchment management recognises need for:

- a broad societal response by civil society, local and national agencies and scientists
- decentralised collaborative management and multi-agency partnership working
- integration of science and governance (analytic-deliberative)
- the right combination of regulation, advice, land use measures, incentives and voluntary action

Explicit recognition and understanding of this can inform policy, process and governance design.
Components of a catchment management ‘template’

An Adaptive Management Cycle

- the complexity, dynamics and trade-offs of catchment management require an adaptive management approach

- and a ‘twin-track’ of deliberative partner and stakeholder engagement supported by targeted scientific research (analytic-deliberative)
Build and Maintain Partnerships
Engage Stakeholders

Characterize Catchment
Identify Problems and Solutions

Set Goals
Prioritize Solutions

Design and Planning

Implement Plan

Monitor Progress
Make Adjustments

Improve Plan

Key
- Pathways
- Evaluation
- Deliberation
- Science
Components of a catchment management ‘template’

**Governance**

- **Partnerships**
  - cross-sectoral and multi-level collaboration and coordination based on recognised responsibilities and duties

- **Stakeholder engagement**
  - inclusive deliberation to integrate environmental and public health criteria with local economic and social objectives, and wider policy goals
  - enhance implementation with local knowledge, acceptance and ownership

- **Locally led**
  - decision-making at the level appropriate to responsibilities for land and water management, with provision for inter-locality cooperation and coordination

- **Transparency and accountability** (apply principles of good governance)

- **Funded** – core (public) and from diverse sources
Components of a catchment management ‘template’

Capacity

• Locally accepted technical providers
  • trusted experts and intermediaries to analyse, advise and mediate

• Comprehensive condition and threat assessments and planning
  • ideally one integrated strategic plan to guide action plans, in accordance with higher level regulation and policy directives

• Knowledge exchange
  • synthesis and communication of information to decision makers, partners and stakeholders through skilled intermediaries and communication and decision-support tools

• Monitoring of performance and outcomes
  • inherent to adaptive management, and to sustaining partner and stakeholder engagement, and funding
  • evaluation criteria to include environmental quality and sustainability, cost effectiveness, and an accepted distribution of benefits and costs
To conclude, critical factors for catchment management:

• Engage all the agencies that have relevant duties and responsibilities, building on local conditions and strengths
• Establish arrangements to manage across administrative and sectoral boundaries, with non-regulatory facilitation and coordination at catchment level
• Recognise that leading individuals or ‘network champions’ will be significant (find political, scientific and managerial leadership at catchment and regional scale)
• Don’t undervalue the activities and time taken to build trust between individuals and organisations
• Focus on inclusivity, dialogue and collaborative linkages to work across silos, developing consensus through committees and advisory groups which draw in different actors
• Give these arrangements legitimacy and ‘standing’
• Adequate representation of local government is essential to ensure accountability of decision making to local electorates
**Critical factors:**

- Develop integrated catchment/regional plans, with goals that are shared locally, plus the strategies and action plans to deliver the targets of higher level policy frameworks and national programmes.
- Develop tools for catchment characterisation, simulation and communication; drawing in partners and stakeholders and changing their perceptions and behaviour can only be achieved through robust scientific research and modelling.
- Integrate scientific evidence into policy, planning and management processes to identify ‘win wins’ and low cost gains.
- Develop the capacity for local analytical and advisory services.
- An independent expert-based scientific advisory group drawn from local and national research organisations and key partners that can review and validate approaches, tools and plans is essential.
- Present scientific data using techniques designed to engage non-scientific audiences e.g. an annual catchment report card.
Extended Export Coefficient Model

T. Krueger

From conceptual modelling to live and interactive scenario development with stakeholders
a platform for stakeholders to **collaboratively frame the scale and severity of the problem**, and develop a collective understanding

modelling of options including BMP depended on local knowledge

stakeholders can model potential solutions in **real time**, stimulating highly **dynamic** and **engaged** discussion

an appreciation of **trade-offs** and **costs** developed

model became a vehicle for stakeholders to **incorporate their knowledge within the problem solving process**, stimulating ownership and trust in the outcomes, and helping to ground truth and validate
HORSEY MERE: Salinity is the central problem while physical and nutrients targets are met.

MARTHAM NORTH: All targets met, but moderate abundance of water plants.

HICKLING: Turbidity, salinity and moderate nutrient enrichment lead to poor diversity and abundance of water plants.

MARTHAM SOUTH: All targets met, but low transparency and abundance of water plants.

THURNE AT MARTHAM FERRY: Meets nutrients and biological targets under moderate transparency, dissolved oxygen and salinity conditions.

HEIGHAM SOUND: Meets many targets, but low transparency and salinity lead to poor overall score. Many data gaps.

Upper Thurne Ecosystem Health Report Card 2007
Project Principals and Partners

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**Other institutions:**
- University of East Anglia; University of Kent
- The Westcountry Rivers Trust
- Broads Authority and the Upper Thurne Working Group
- The Association of Rivers Trusts
- Cornell University; New York State Department of Environmental Conservation; Delaware County Action Plan; the Upper Susquehanna Coalition; and the Hudson River Estuary Programme
- The South East Queensland Healthy Waterways Partnership
- City of Aalborg, Denmark
- Drinking Water Company Drenthe and Drenthe Province, Netherlands
- OOWV Water Supplier, Lower Saxony, Germany

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**For more information:** [http://www.watergov.org/](http://www.watergov.org/)