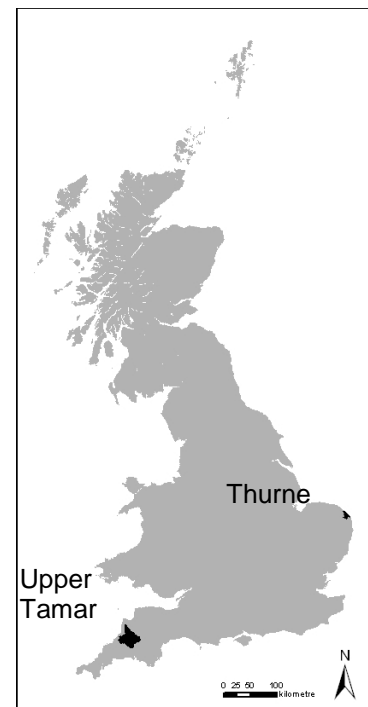
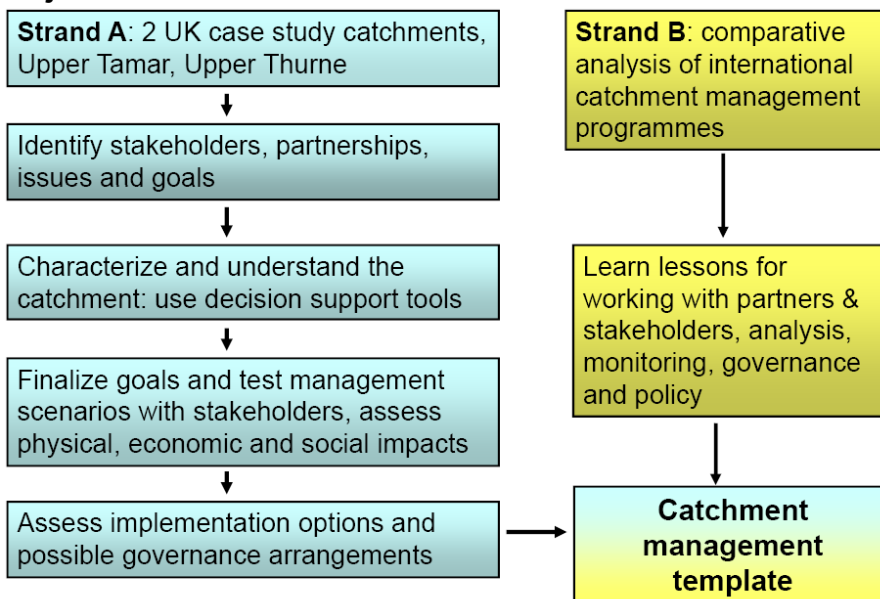


Catchment Management for the Protection of Water Resources: A 'Template'

A Rural Economy and Land Use Programme research project investigating the appropriate combination of research, measures and governance for a collaborative and adaptive approach to catchment management to protect rural land and water resources.

The term '**catchment**' refers to the sub-basins of tributaries or the whole river basin itself, as defined by the watersheds that divide drainage areas. In some countries '**watershed**' also refers to this basin or catchment land area. The need to manage water from its source to its sink, and the inter-dependence of our water uses with each other and natural processes, require holistic and catchment-based management. Technical capability, leadership and coordination of actions are required for catchments that rarely correspond to administrative boundaries.

Project Structure and Activities



Over abstraction, flood risk and water quality are common concerns. Water pollution comprises point and non point source contamination including discharges from water treatment and industry, surface run off from fields, seepage of nutrients from soil into ground water, stream bank erosion and discharges from dispersed and numerous minor point sources such as field, farmyard and urban drains.

The **Rural Economy and Land Use Programme** is a UK-wide research program carrying out interdisciplinary research on the multiple challenges facing rural areas. It is funded by the Economic and Social Research Council, the Biotechnology and the Biological Sciences Research Council and the Natural Environment Research Council, with additional funding from the Scottish Government and the Department for Environment, Food and Rural Affairs.

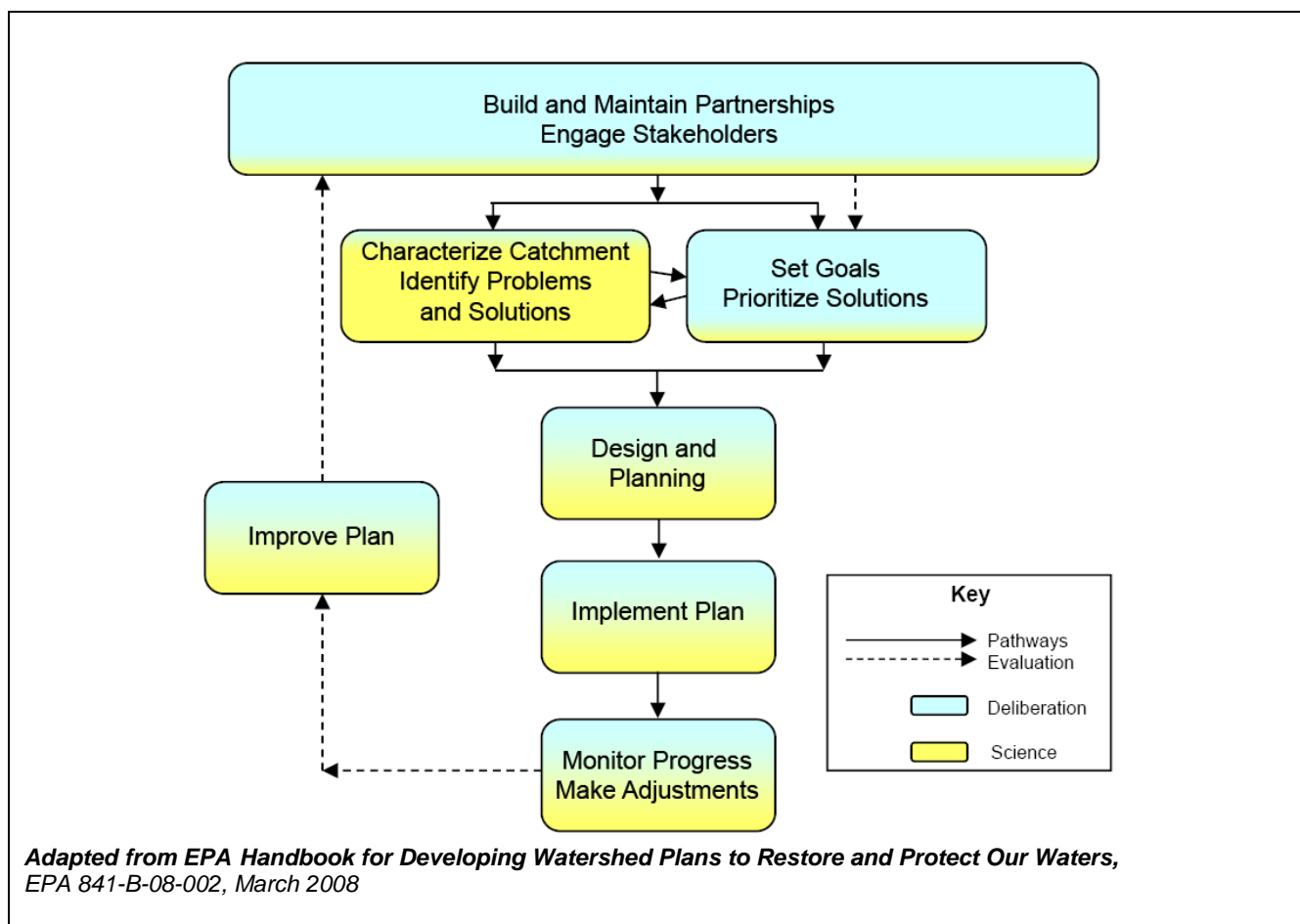
Based on the achievements of innovative catchment management programmes in the USA, Australia and north west Europe, and on piloting of approaches in England, this project has derived a 'template' to guide integrated catchment governance through:

- the use of science and communication tools to guide policy, decision making, and management measures;
- collaborative partnerships and stakeholder participation that direct and enhance decision making; and
- decision making and implementation at the level which is most effective and accepted within catchments.

Key Components of the Template

An Adaptive Management Cycle

The complexity, temporal and spatial scales, dynamics and inevitable trade-offs of catchment management necessitate an adaptive management cycle, collaboration between agencies and levels of government and a 'twin-track' of deliberative partner and stakeholder engagement supported by targeted scientific research.



Aims and Outcome Criteria

Delivery of Long Term Water Quality Improvements and Sustainable Management of Water Resources

Ultimate goals are to sustain designated uses of land and water in a catchment with a functioning ecology, accounting for inter-generational needs and guarding the future against present uses.

Cost Effectiveness and Efficiency in the Delivery of Outcomes

Achieved through the prioritization of needs and targeting of resources based on catchment

assessments, with flexibility in policy and delivery for well adapted local solutions. Monitoring and reporting should also demonstrate cost effective delivery compared to alternative approaches.

Assurance and Acceptance of the Burden of Costs and Distribution of Benefits

Allocation of catchment resources based on all legitimate interests and values that is accepted as fair and equitable, and an equitable allocation of financial and other costs to sustain catchment management.

Governance Components

Meaningful and Sustained Opportunities for Public Participation

Deliberation with partner organizations and other stakeholders can integrate environmental and public health criteria with economic and social goals. Stakeholders can contribute to catchment assessments and programme design, and implementation will be enhanced by local knowledge, acceptance and ownership.

Cooperative Partnerships Within and Between Levels of Government, Sectoral and Area Responsibilities, the Private Sector and Non-Governmental Organizations

Catchment programmes should be built from existing organisations and partnerships, centred on those with current management responsibilities, and working within the framework of prevailing law. The building of partnerships must establish shared goals and recognize differentiated interests and responsibilities. Catchment management requires technical capability, leadership and capacity for coordination covering at least agriculture, water supply, wastewater and waste management, highway and other storm runoff, stream corridor restoration, and development and spatial planning. Laws are needed that facilitate rather than prohibit partnership arrangements and appropriate delegation.

Legitimacy and Institutionalization of Programme Status

Integrated land and water management involves local responsibilities and requires inclusive deliberation at the local level under the framework of existing multi-level government. Thus locally acceptable responsibilities and rights must be translated from higher level regulation, with provision for inter-locality cooperation and coordination. Informal partnerships with effective leadership are often a starting point but growth in funds, capacity and authority usually necessitate standing, legitimacy and a formalised legal status.

Upper Susquehanna Coalition (USC) in the Chesapeake Bay Watershed, USA:

From 1992 the USC operated through informal collaboration between county Soil and Water Conservation Districts to work on non point source water quality issues in the headwaters of the Chesapeake Bay. In 2006 it became a Conservation District Coalition using a Memorandum of Understanding (MOU) based on New York and Pennsylvania state law that allows multi-District agreements. The Tioga County Soil and Water Conservation District is designated in the MOU as the USC Administrator, responsible for all contractual and other legal obligations.

Transparency and Accountability

All data, synthesized information and decision making should be available to the public and open

to scrutiny. Key actors must assume and be accountable for their delegated responsibilities and outcomes. Accountability through elected officials is preferred, implying that at least an oversight role for local government is important.

Funding

Successful catchment management programmes access diverse funding sources including the private sector. However, continuity in institutional development and capacity building can be expected to require core public funding.

Capacity Components

Mobilization of Locally Accepted Technical Providers

Trusted individuals, agencies or groups are needed for capacity building and advisory work, not least with farming communities. Their essential functions include convening and mediating to foster trust, participation, collaboration and co-production of knowledge (see examples below).

Capacity to Conduct Comprehensive Condition and Threat Assessments, and Strategic and Action Planning, Based on Sound Science and Best Available Knowledge

Programmes must be able to make assessments of the condition of and all threats to water resources and prepare comprehensive and integrated plans. Ideally all partners will agree and refer to one integrated plan for the catchment. Planning and implementation must be based on credible science, and there must also be the capacity to commission external expertise and scientific peer review.

Capacity for Monitoring of Performance and Outcomes

Monitoring and evaluation of the processes and outcomes of catchment management is essential to the learning and responsiveness inherent in an adaptive management cycle, and for determination of the effectiveness and efficiency of outcomes. Reporting on governance, achievements and outcomes is also inherent to sustaining stakeholder and partner engagement, and to demonstrating the benefits of collaborative and integrated catchment management.

Capacity for Knowledge Exchange

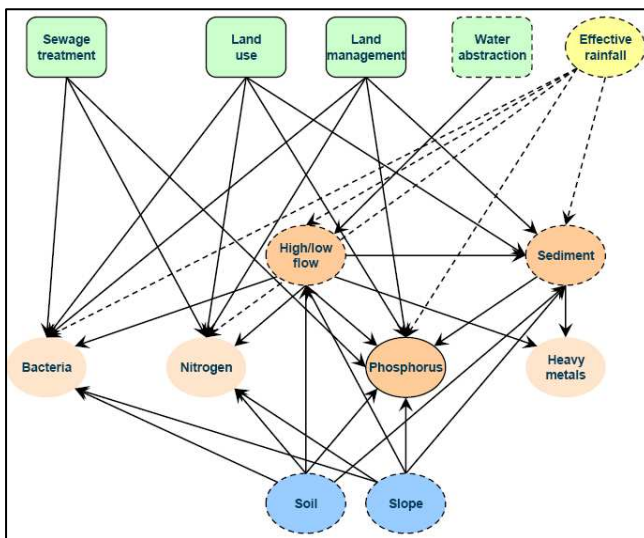
Programme technical providers need to act as brokers to compile, synthesize and communicate information, enabling decision makers to consider and use diverse data sources. Education about water resources for children, parents and communities can be a facilitator for commitment and action and a two-way process. Gaining the benefits of partner and stakeholder participation in terms of enhanced diagnosis, planning and implementation requires an accessible knowledge base, skilled intermediaries, and high quality communication and decision-support tools.

Some Illustrations

Examples of Technical Providers for Catchment Management:

- In the USA – the mission of Soil and Water Conservation Districts is to develop and oversee effective soil and water conservation and agricultural non point source water quality programmes with the involvement of citizens and agencies, through education, partnerships, planning, and implementation.
- In South West England a charity - the Westcountry Rivers Trust - works to preserve, protect, develop and improve all water bodies and to advance education of the public in the management of water.
- In East Anglia the Broads Authority, a member of the National Park family, has shared purposes to conserve and enhance the natural and cultural heritage of the Broads, promoting peoples understanding and enjoyment as well as protecting navigation. It does this with research, partnerships and projects that also consider local economic and social interests in the Norfolk and Suffolk Broads.

Modelling With Stakeholders: Both the Tamar and Thurne studies used models to communicate to stakeholders and foster understanding about the contribution of nutrients and sediment from land uses to water quality degradation. Illustrative examples are given below.



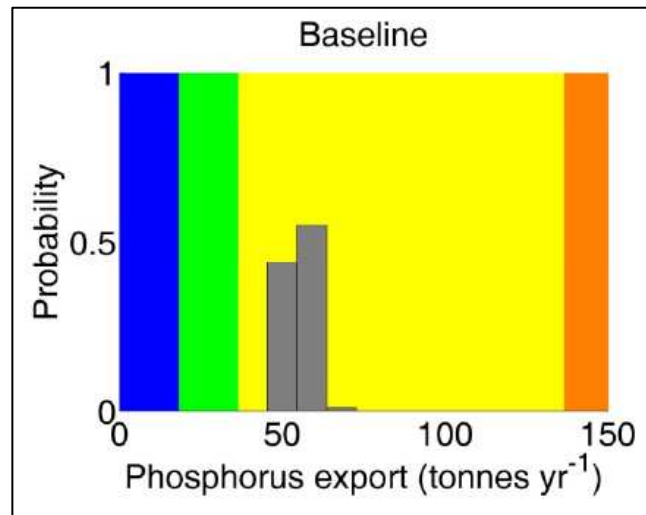
A graphical conceptual model (see left) and use of non-technical language enabled stakeholders to influence model development from the start.

Use of a model informs deliberation, making complexity comprehensible and manageable, whilst deliberation around its design, input data, use and outcomes can make a model usable and accepted.

An export coefficient based modelling approach was used and user-friendly interfaces for data input, scenario testing and display of output (see below) were developed with stakeholders.

The inherent uncertainty of data and modelling was incorporated with output presented as a probability distribution; in this case for phosphorus export (see right). Farmers appreciated this and helped explain it to others in non-scientific terms.

The colour coded background matches the classification used in the UK in implementation of the EU Water Framework Directive. Here 'green' represents the band of phosphorus loading judged necessary for a water body to be in 'good ecological status'. Stakeholders used the model to explore the effects of changes in land use, livestock numbers, farming practices and investment in sewage treatment facilities on phosphorus export in a sub-catchment.



Further Information

This research has been carried out at the Universities of London, East Anglia and Cornell. Partners in the project include: The Westcountry Rivers Trust, the Association of Rivers Trusts and the Broads Authority and Upper Thurne Working Group in UK. Delaware County Action Plan; the Upper Susquehanna Coalition; and the Hudson River Estuary Programme in New York State, USA. South East Queensland Healthy Waterways Partnership, Australia. City of Aalborg, Denmark; Drinking Water Company Drenthe and Drenthe Province, Netherlands; and OOWV, Germany.

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