Values related to water resources and water management

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Water values

Water has benefits/values associated with its use or non use

- **Some of the values are reflected in markets - eg some recreational activities, water for industries**

- **Others are not - eg amenity and landscape effects, non use values, some recreation activities**

... different tools available to estimate benefits

... focus on 'stated preference methods'

Water values

- Knowledge on water values can inform policies at different stages of development and/or implementation
- Knowledge on cost-effectiveness important – but does not contribute to question whether an investment/a policy is socially worthwhile
- Sound science should underpin valuation:
  - but there is often a lack of information/models;
  - or the scientific ‘state of the art’ to assess status or change differs from the approach used by the relevant decision making bodies (trade relevance against scientific ‘rigour’?)

Water values

Valuation of water: 2 case studies

Scenario of change	• Water quality improvements	• Reduction in risk associated with high and low flows in rivers
Related policy	• Water Framework Directive (WFD)	• Flood Bill
Ecological/hydro-logical data links	• screening tool/water characterisation data	• … past trends … impacts? → lack of info!

Water quality improvements

- The WFD requires Good Status (GS) of water resources by 2015
  - GS → good ecological and chemical status for surface waters, good chemical and quantitative status for groundwater
- What are the benefits of achieving GS, in a given period of time?

Water quality improvements

- Benefit estimates can be used for:
  - Economic impact assessment of policy implementation (efficient policy?)
  - Justification/basis for exemptions (disproportionate cost assessment)
  - Information on public support for WFD, and limits of taxpayers' willingness-to-pay (WTP) for improvements

Water quality improvements

- Preferences for water quality improvements related to WFD implementation

- Two types of water bodies: rivers and lochs
- Two dates: improvements in 7 and 20 years

- Use of screening tool to create maps/SEPA water characterisation data

- Method: choice modelling

→ estimates of WTP for a % improvement in the number of rivers and lochs under Good Ecological Status

→ time preferences of achieving improvements

Water quality improvements

- Preferences for water quality improvements related to WFD implementation

→ estimates of WTP for a % improvement in the number of rivers and lochs under Good Status

→ time preferences of achieving improvements

Water quality improvements

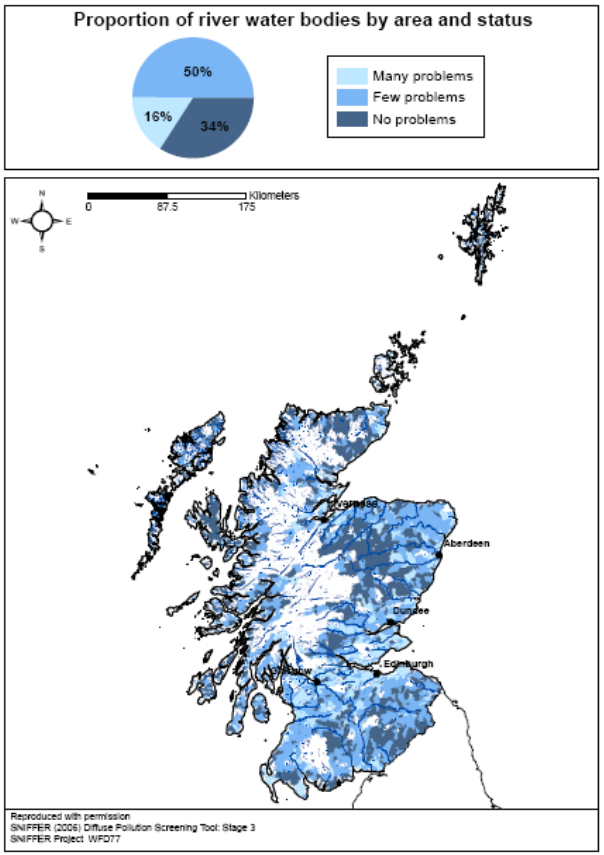
- Preferences for water quality improvements related to WFD implementation

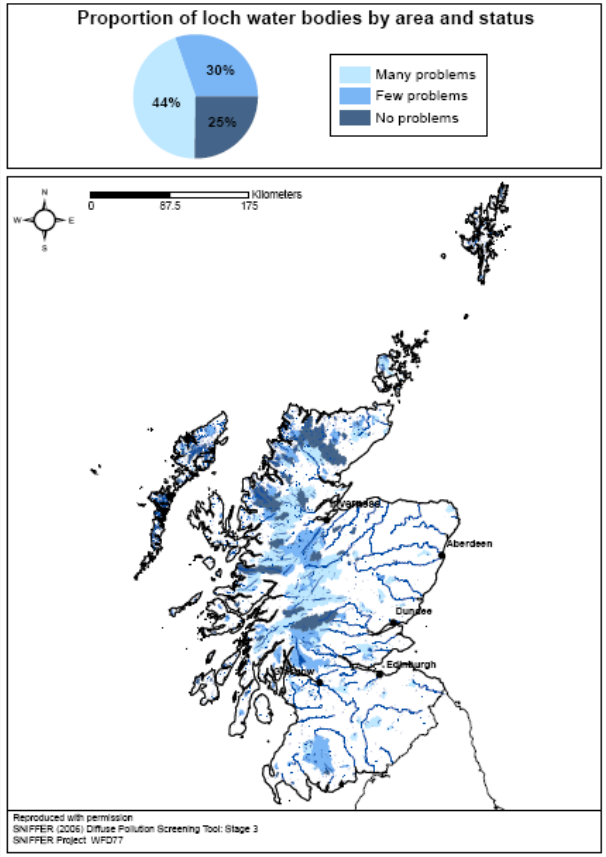
CARD 4B -LAKE

High - NO Quality- PROBLEMS		A diversity of underwater plants, floating lilies and tall flowering plants. Varied fish population, including trout and coarse fish. Insects such as dragonflies are present. Water with right degree of clarity and no noticeable pollution. Natural and seasonal variations in water levels. Suitable for contact activities.
Medium - FEW Quality - PROBLEMS		Some underwater and floating plants in shallow areas and around the lake. Some coarse fish and other animals present but limited. Insects are rare. Slightly unclear and occasionally discoloured water. suitable for contact activities in some areas but no others.
Low - MANY Quality - PROBLEMS		Very few plants, except blanket weed, and very few fish or other animals, except worms and leeches. Cloudy, discoloured and possibly bad-smelling water. Unsuitable for contact activities.

Water quality improvements

- Preferences for water quality improvements related to WFD implementation





Water quality improvements

- Results (Scotland-wide survey N=432); £ $hh^{-1}yr^{-1}$

	Scottish RB	Solway-Tweed RB	Pooled
River 7 years	1.69 (0.007)	0.24 (0.003)	1.05 (0.004)
Loch 7 years	1.11 (0.005)	0.54 (0.004)	0.87 (0.003)
River 20 years	-	0.47 (0.004)	-
Loch 20 years	-	0.3 (0.004)	-

Water quality improvements

- Preferences differ across regions and administrative districts
- Benefit estimates can be aggregated and compared to costs (on a national and sub-national scale)
- SRB prefer river restoration over lochs
- SRB prefer fast restoration

→ Ongoing work: linking benefit estimates to costs

High and low flows

- Flood Risk Management (Scotland) Bill:
  - Responsible authorities should

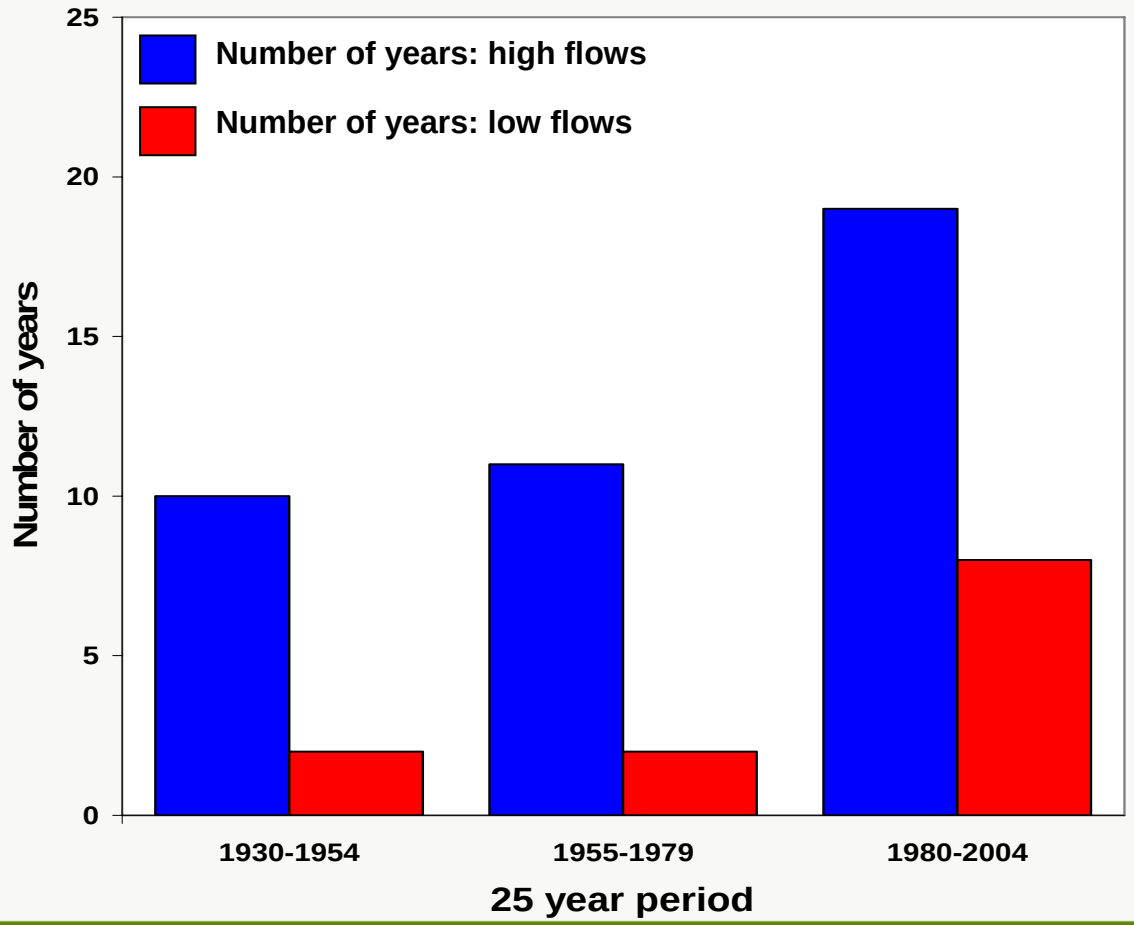
  "act in the way best calculated to manage flood risk in a sustainable way,
  - (i) promote sustainable flood risk management,
  - (ii) act with a view to raising public awareness of flood risk, and
  - (iii) act in the way best calculated to contribute to the achievement of sustainable development ..."

  - Cost/benefit analysis must consider flooding and non-flooding benefits;
  - Impact of climate change must be considered

High and low flows

- Is there an increasing risk of flooding?

River Dee



High and low flows

- → Use sustainable water management options (such as wetlands, forests etc.)?
- But:
  - not much *known* about effectiveness of these options to reduce floods;
  - Uncertainty about future climate persists: if it's a problem, what's the scale of it?

- Is it really worth investing?
- What are options of action to cope with the issue?

What are the views of the public re these options?

High and low flows

- Three fundamentally different options:
  - Do nothing
  - An insurance scheme
  - Sustainable flood management (‘Soft engineering’)

- Two measures of preferences
  - Usefulness ratings
  - Willingness to pay (WTP; contingent valuation)

High and low flows

Aims of research:

- Better understanding of public perceptions and preferences towards adaptation to climate change and flooding:
  - cognitive hierarchies
- Assess values related to governance (ie processes and mechanisms implied in policies)
  - often neglected for (economic) decision making rationales
  - should gain in relative importance if outcomes (ie future flood risk plus adaptive measures) are highly uncertain

Social strata/ background factors

Income, education, age, gender etc

Core values and value orientations	Attributions, perceptions and applied values	Evaluation of policy options
Self-enhancement – Self-transcendence	Coping appraisal	Willingness to Pay
Governance values/principles (safety, solidarity, efficiency …)	Threat appraisal	Usefulness ratings

abstract
situation-transcendent
stable ?

concrete
situation-dependent
unstable ?

High and low flows

- Scotland-wide survey (N=1050)
- Methods:
  - Structural Equation Modelling (SEM)
  - Maximum Likelihood Estimation (Spike Models)
- Results:
  - ~ 50% were not WTP for any adaptation option
  - Soft engineering perceived to be more useful than Council insurance
  - Mean WTP ~ £40 per year

High and low flows

Results:

- SEM: hierarchical pattern emerges (not all hypothesised constructs)
- Probabilistic models of WTP (spike models) and SEM tell same stories → some mutual validation of models?
- Governance values are underpinned by more fundamental values; governance values, together with beliefs, explain evaluations of policy options

High and low flows

Conclusions:

- SEM can be used to find most parsimonous (probabilistic) WTP model
- However, the best fitting WTP model does not contain fundamental values and reflect the complex network of cognitions

High and low flows

Conclusions:

- How stable are preferences (recency of 2007 floods in England, financial crisis?)
- However concrete and possibly unstable preferences provide information policy makers are particularly interested in (public support, monetary benefits/WTP)
- Can knowledge on stable preferences help to predict changes in public support/WTP? → More research needed
- 'Dual' approach very desirable!!

A new water and climate change fund

A

Reduce risk:
soft engineering

↓

Changes in
water management

?

C

Do nothing

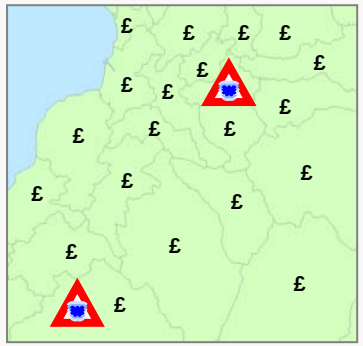
?

B

Cope with higher risk:
council insurance

↓

Insurance against
damage to public facilities



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