Building resilience to respond to future environmental change across Scottish Catchments

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1. Introduction

Catchments are under **multiple pressures** from human use (Fig. 1). In the future, **increasing demands** and the effects of **climate change** will further impact on the ability of catchment systems to provide **food, water and energy security**, and other services such as biodiversity and livelihoods of local people (Fig. 2).

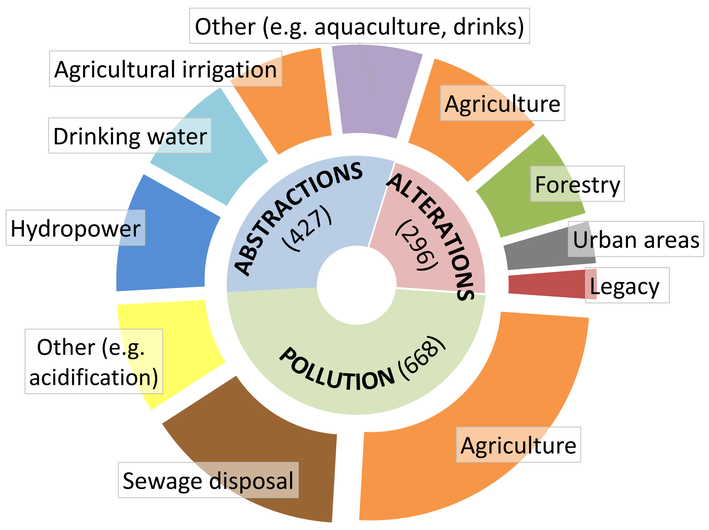

Fig. 1: Pressures on Scottish waterbodies (no. affected 2008 RBMP).

There is a need to **quantify and optimise multiple benefits** from catchments. However, there are **uncertainties** surrounding ecosystem service modelling, climate change and stakeholder opinion which is a further challenge for catchment management (Fig. 3).

The aim of this project is to explore possible **trade-offs** and **synergies** between catchment uses and find ways to optimise landscape scale ecosystem service provision in Scottish catchments.

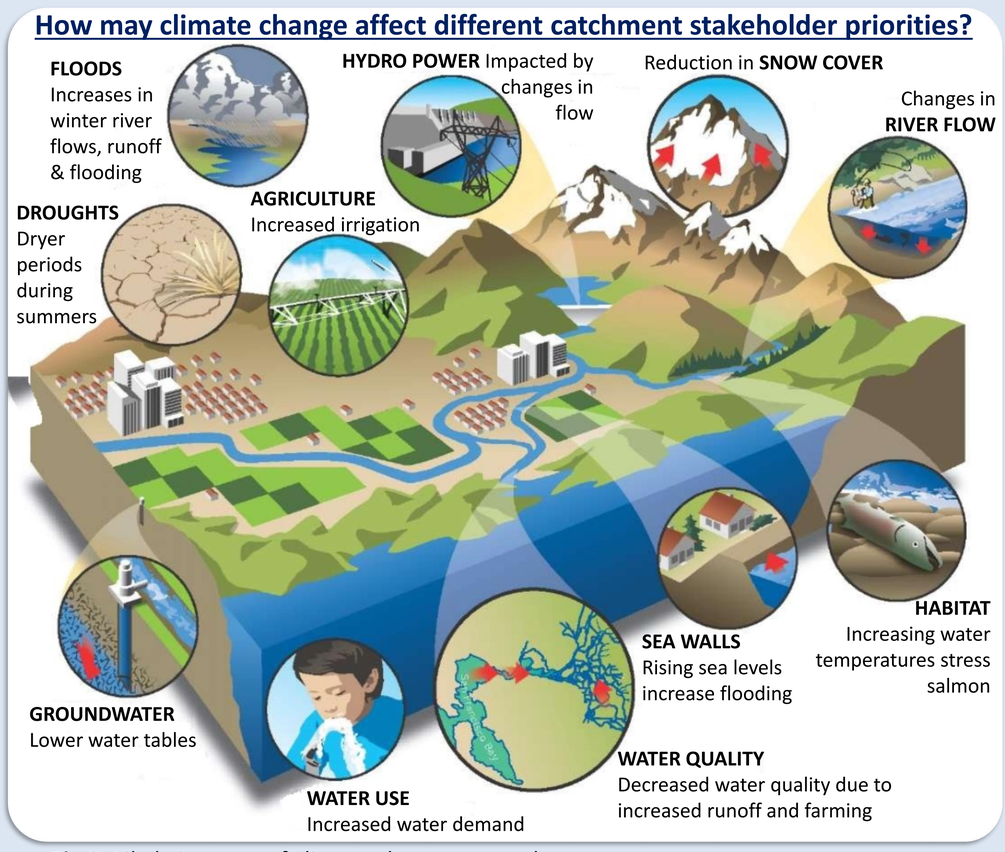

Fig 2: Likely impacts of climate change on catchment systems (adapted from www.epa.gov).

2. Methods & project plan

Three Scottish catchments with **contrasting pressures and stakeholder conflicts** will be identified. These catchments and their associated issues will provide a platform for the development of a transferable **socio-ecological framework** to guide decision-making and future catchment management.

The project will adopt both quantitative and qualitative methods and participatory approaches to generate data, which will be used for:

- Development of **conceptual models** in association with stakeholder groups to illustrate ecosystem service connectivity within catchments and identify **multiple benefits, trade-offs** and potential **conflict**
- Scenario development of catchment futures that will be coupled with **best-worst scaling** of stakeholder judgments
- **Elicitation of expert opinion** on the uncertainties of catchment management and ecosystem service provision, using fuzzy distributions
- Running of a **Stakeholder Jury**

Finally, the **spatial decision-making tool Marxan**, conventionally used for reserve planning, will be deployed to develop a framework to allow maximisation of multiple benefits in catchments. This will utilise data gained from the mixed methods outlined above.

3. Future impacts

The project will deliver strategies to promote stakeholder **collaboration as opposed to conflict.** The socio-ecological framework for decision-making will **optimise landscape scale ecosystem delivery** in the three Scottish catchments, and make them more resilient against the impacts of future climate change.

By doing so the project will deliver a **blueprint** for more integrated, effective and sustainable management of catchment systems and the decision-making framework will be **transferable** to catchments outside of Scotland.

The **mixed methodologies** that will be developed to achieve the project's aim will in themselves form important outputs. The **novel mechanisms** may be transferable to other applications to help unpack stakeholder conflicts and identify opportunities for maximising ecosystem services across landscapes.

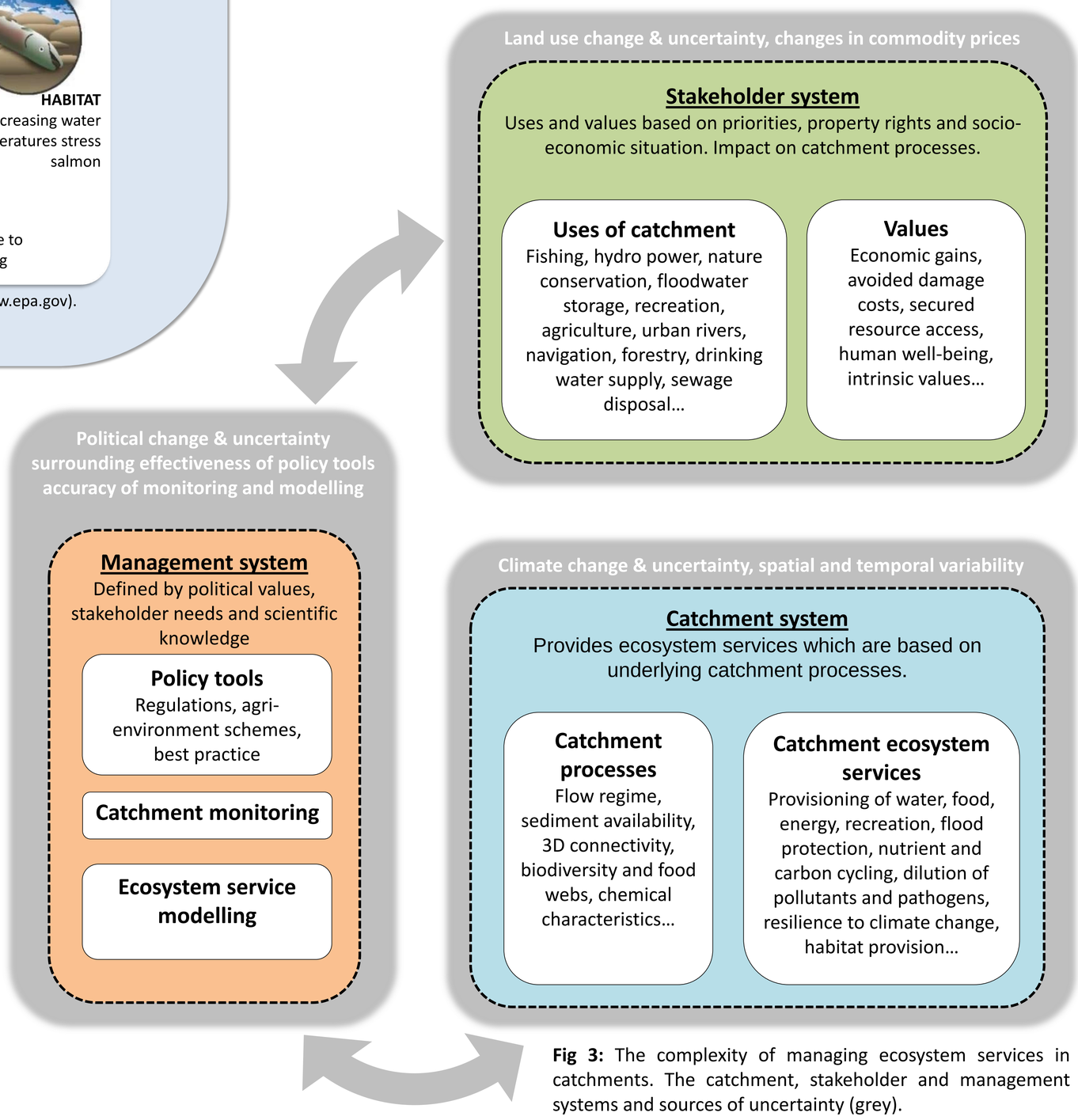

Fig 3: The complexity of managing ecosystem services in catchments. The catchment, stakeholder and management systems and sources of uncertainty (grey).

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