An Interdisciplinary Exploration of Tree Planting for Natural Flood Management

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Aims and Objectives

- **Can a qualitative understanding of lived experience explain the political behaviour and preferences of 'Land Managers' when considering forested landscapes for NFM?**
- **Can 'socially' determined parameters be integrated into traditionally quantitative methodologies of planning for land-use change?**
- **How does farmer/ land manager knowledge and expertise inform the process of planning forested landscapes for NFM? Does involvement in this process affect the uptake and long-term planning of Land Managers?**

Local Expertise

The neglect of local, rural knowledge, 'lay' expertise[7] has impacted the effectiveness and uptake of land management and land use policy.

- It has been clearly demonstrated that early engagement of land managers increases the support and uptake of opportunities in natural flood management[8]
- Less well evidenced is the question of effectiveness: Is knowledge and information that could improve the efficacy of modelling forested landscapes for natural flood management being missed?

Provisional Findings

- Support the hypothesis that situated expertise is vital for development of the hydrological model
- Shed light on the importance of landscapes in decision making
- Contradict previous suggestions that a lack of uptake of woodland planting is due to land manager inertia.

1. Exploring Landscapes

Landscapes in the UK are all accounted for. Policy has focused on 'financial viability'[4] of change whilst there may be greater complexity in the individualised, localised perceptions of landscape.[6]

Researching 'lived experience' through semi-structured walking or kitchen-table interviews and participant mapping enabled:

- Co-creation of knowledge with regards to catchment hydrology
- Dialogues of the 'importance' of landscapes
- Identification of local, situated expertise
- Discussions of alternative scenarios and preferences for tree planting.

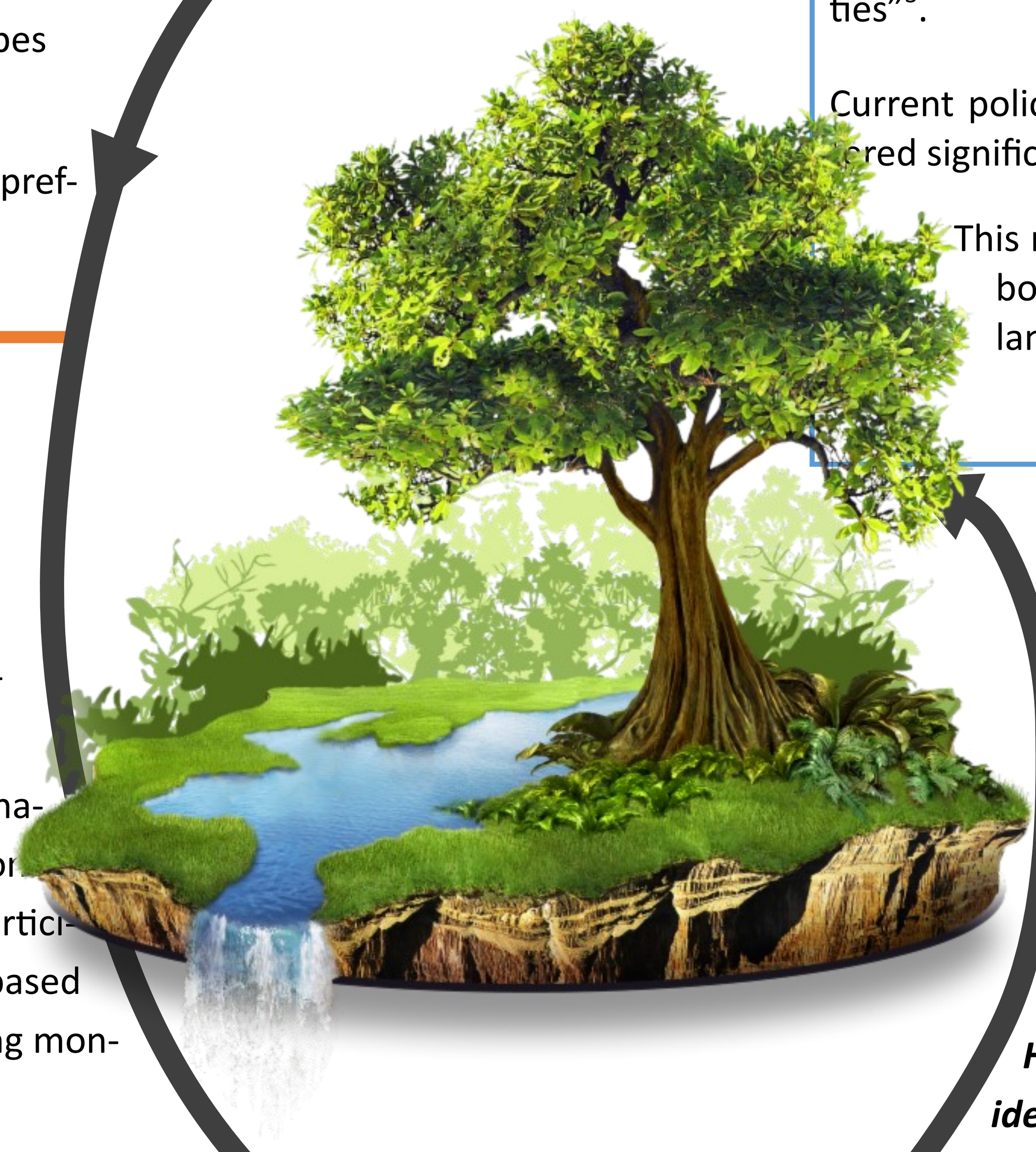
2. Base Model

Models are a simplified version of reality.

In 'wicked' scenarios models (with inherent uncertainties) may still inform decision making.

Expertise from interviews and physical analysis of the catchment has informed model choice, simplicity & build design.

SHETRAN , a Physically Based Spatially Distributed model, enables an exploration of runoff and sediment loss depending on factors including soils and land use (of key importance to participants). Open source remote sensed data, (ground-truthed based on catchment and participant information) is calibrated using monitored level data.



3. Alternative Scenarios

Alternative scenarios are co-created being directly informed by participant preferences and perceptions. Features identified include: hedgerows, small farm woodlands, slope woodland, riparian planting, wood pasture .

The SHETRAN model for the catchment is at a grid square resolution of 100m, allowing for smaller plantings identified in the farm landscapes.

The complexity of land-use in a traditionally farmed landscape can be modelled, including impacts of different vegetative covering, e.g. evapotranspiration and infiltration

Context

Climate change is increasing the uncertainty of extreme weather events, a need for forested landscapes is a new paradigm and flood management is being directed towards more 'natural' methods with its own catchphrase 'slow the flow'.

However, with little data of efficacy for large sites or the impacts of land management, planting trees for NFM is "context and scale specific"[1]

A 'Wicked'[2] (or post-normal) problem with inherent uncertainties: solutions may rely on a deliberative process with "extended peer communities"[3].

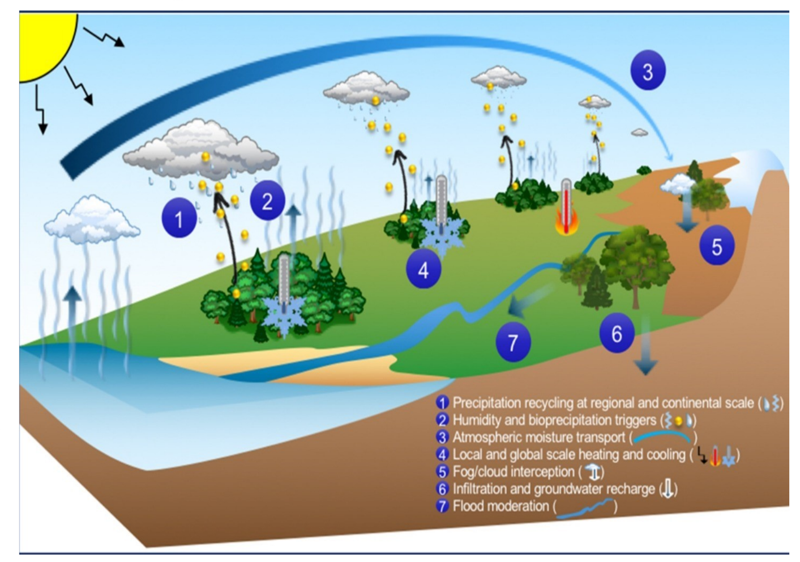


Figure 1: Effects of forests on water and climate at local, regional and continental scales through change in water and energy cycles from Ellison et al 2017

Current policy and planning tends to be technocratic and teleological, processes which have encountered significant 'social' barriers.

This research takes a strongly participatory approach, placing the Land Managers as 'expert' to both enable, co-create and problematise an alternative approach to designing alternative land-use scenarios.

4. Evaluation and Analysis

Can social/physical, qualitative/ quantitative data be successfully combined?

What impact does participant expertise have on the modelling process?

Have potential planting scenarios been identified

Analysing and evaluating the scenarios with participants and other stakeholders we hope to enable:

- The identification of catchment specific impacts
- solutions or key factors which have troubled the current, largely technological, approach

Research Impacts

- add to literature on agricultural / rural decision making
- engage farmers / land-managers with academic research
- identify and acknowledge wider fields of expertise than that within academic/policy environments including lived experience, rural scientific and situated knowledges
- explore impacts of landuse on the synchronicity of flood peaks in a 'flashy-flood' catchment
- explore the potential impact of land use change on flood behaviour and flood 'risk' in a complex river sys-

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1. Dadson et al (2017); 2. Lane (2017); 3 Funtowicz & Ravetz (1993); 4. NCC (2018); 5. Ingold (2000); 6. Emery and Carrithers (2016); 7. Wynne (1996), Collins & Evans (2002), Lowe et al (1997); 8. Lavers & Charlesworth (2018), Short et al (2018)

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